

AI AUTOMOTIVE INDUSTRIES

**AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT**

JUNE 1, 1955

In This Issue

Exhaust Valve Corrosion in Gasoline Engines
Producing 3000 Passenger Car Frames Per Day
Experimental 195-Hp Gas Turbine Race Car
Seven Lines of Cars on One Assembly Line
Automatic Painting of Bodies and Sheet Metal
Automotive Requirements for Machine Tools

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A C H I L T O N P U B L I C A T I O N

Bremen Bearings, Inc., uses SUPERLA Soluble Oil to give bearings the clean, cool treatment

PRECISION NEEDLE BEARINGS are the exclusive product of Bremen Bearings, Inc., Bremen, Indiana. SUPERLA Soluble Oil is used exclusively in all eight of the Company's Cincinnati Centerless Grinders. Plant management experimented with various soluble oils before settling on SUPERLA. They found none could compare with SUPERLA Soluble Oil with respect to wheel loading, stability and tool machine cleanliness.

Plus these benefits, Bremen found


SUPERLA mixed readily with water regardless of degree of hardness. The Company found, too, that they got longer tool life and maximum rust protection of work and machines.

You will have the same experience with SUPERLA Soluble Oil. Find out. Inquire of your Standard Oil lubrication specialist. In the Midwest call your nearby Standard Oil office. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Ill.



STANDARD OIL COMPANY (Indiana)

Franklin D. Clark (right), Sales Manager, Bremen Bearings, Inc., and Standard Oil lubrication specialist E. A. Hunt, inspect needle bearing. Gene Hunt is well qualified to assist industrial plants on lubrication problems. In addition to his three years' experience in industrial lubrication sales work, Gene has an M. E. degree from Purdue and has completed the Standard Oil Sales Engineering School. Customers find this experience and training pay off for them.



Bearings being ejected from Cincinnati Centerless Grinder at Bremen Bearings, Inc. The Company manufactures needle bearings to customers' specifications in sizes from 1/16 to 1/2 inch with tolerances of .0001" and finishes to 3 micro-inches. SUPERLA Soluble Oil is used on all of the Company's grinders.



**Plant produces 3800 tons
of aggregate daily...**



Courtesy — Iowa Manufacturing Company, Cedar Rapids, Iowa

COTTA TRANSMISSIONS provide dependable power

Here is the kind of work that calls for a *Cotta* Transmission... where continuous, trouble-free, *heavy-duty* operation is important.

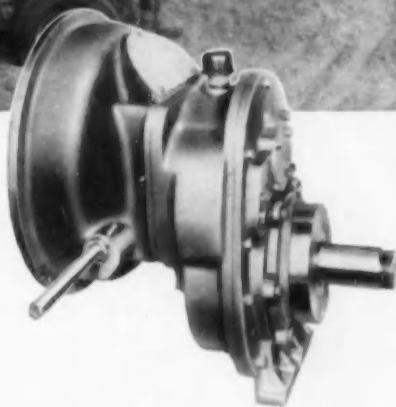
This CEDARAPIDS Commander crushing and screening plant, operated by the Maudlin Construction Company of Webster City, Iowa, on a strenuous 10 hour schedule, produces 380 tons of minus 1½" aggregate every hour.

Cotta Transmissions are precision built by *specialists* skilled in the manufacture of heavy-duty power transmissions and gear reducers... extra assurance of dependability and long service.

THIS INFORMATION WILL HELP YOU

Diagrams, capacity tables, dimensions, and complete specifications sent free on request. Just state your problem—COTTA engineers will help you select the right unit for best performance. May we work with you?

COTTA TRANSMISSION CO., ROCKFORD, ILLINOIS



If you have a power problem on heavy equipment — cranes, locomotives, drillers, shovels, etc. — with input torque ranging from 150 to 2000 foot pounds, Cotta standard or "engineered-to-order" Transmissions will serve you better and longer... give you outstanding performance at money-saving low cost!



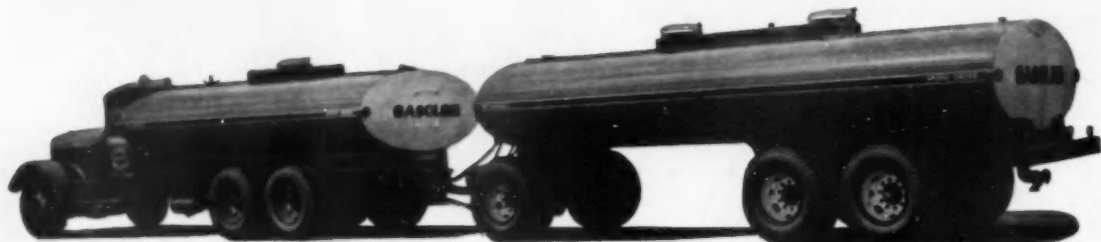
COTTA

**HEAVY-DUTY
TRANSMISSIONS**

"Engineered-to-order"

Get a Bonus from fuel, tires, brakes... safely reduce the weight they shoulder. Look, for example, at the truck-and-trailer gasoline tank unit below. It totes a 6000-gallon load. The tanks are made of Mayari

R. As a result, they weigh 22% less than carbon steel tanks of equal strength and capacity. Mayari R, a high strength, low alloy steel containing nickel is produced by Bethlehem Steel Co., Bethlehem, Pa.



22% less deadweight **...yet load capacity remains 6000 gallons** **with help from a Nickel Alloy Steel**

YOU CAN TRIM off hundreds of pounds of needless weight from a vehicle without changing its load capacity.

There's a simple, safe way: *design to utilize high strength, low alloy steel containing nickel.*

Steels of this type, in thin light sections, provide the same strength as thicker, heavier sections of plain carbon steel.

These high strength steels respond readily to fabrication including welding and cold forming. Thus, the nickel steels enable you to reduce both time and cost per unit.

Furthermore, high strength, low alloy steels containing nickel provide better resistance to many types of corrosion. In fact, they offer 4 to 6 times greater resistance to atmospheric corrosion than does ordinary structural steel. Obviously, for commercial automotive vehicle bodies these alloy steels

are first choice.

Moreover, their rugged resistance to impact, wear and abrasion increases the life of structures subject to hard usage.

High strength, low alloy steels containing nickel along with other alloying elements are produced under a variety of trade names by leading steel companies.

Booklet gives complete story

If you use or produce automotive vehicles, get the facts about these nickel alloyed steels. Send for a copy of "Nickel-Copper High-Strength, Low-Alloy Steels." Cover to cover, this illustrated booklet is full of helpful information and data. See how nickel steels can save you money . . . and how they help vehicle operators step up revenue per ton mile. Write for your copy now.



THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
New York 5, N.Y.

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE PUBLISHED SEMI-MONTHLY

JUNE 1, 1955

VOL. 112, NO. 11

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As part of its worldwide automotive and aviation news coverage, AUTOMOTIVE INDUSTRIES is serviced by International News Service and has editorial correspondents in major United States and foreign industrial centers.

MEMBER



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NBP

National Business
Publications, Inc.

ABC

Audit Bureau
of Circulations

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.
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This Cleveland, now driving an octagonal thickener in a New England paper mill, is a real "old timer". Originally installed nearly 40 years ago in a different application, it is still on the job after so many years of constant service.

Where you can use a Worm Gear Drive to best advantage

WHEREVER power transmission calls for a compact, safe, space-saving speed reducer, a Cleveland worm gear drive is your first choice.

The right angle construction of a worm gear saves space. High shock load resistance and efficient performance are inherent. Parts are reduced to a minimum. There's smooth, uninterrupted torque flow and quiet running. Correct gear alignment is maintained. Gearing is enclosed in an oil bath, assuring positive lubrication, minimum maintenance and safety for operators. The case hardened steel worm and nickel-bronze gear actually improve with use, adding to long life. And, with Clevelands, you get the extra advantages of the 42 years' experience of specialists in building worm gears.

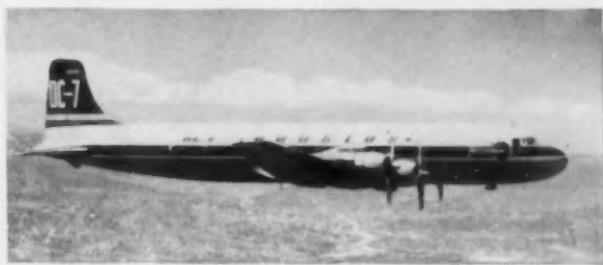
In thousands of cases, Cleveland speed reducers have operated for the life of the driven machine through years of severe service. Get the complete Cleveland story, before you install a speed reducer; see how much Clevelands can do for you. Write for helpful technical advice and ask for Catalog 400. The Cleveland Worm and Gear Company, 3274 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

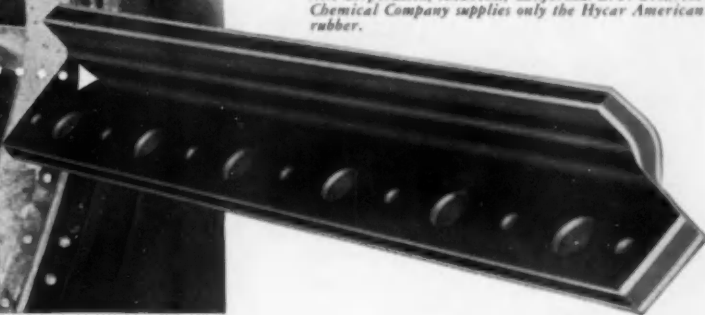


CLEVELAND
Worm Gear
Speed Reducers

Another new development using
B. F. Goodrich Chemical raw materials



Supercharger mounting brackets designed and manufactured by Stoner Rubber Company, subsidiary of Carlisle Corporation, Anaheim, California. B. F. Goodrich Chemical Company supplies only the Hycar American rubber.



EVERYBODY BREATHES EASIER AT 15,000 FEET ...with Hycar's help

PARTS inside an aircraft engine nacelle operate in a tough environment. This is where you'll find Hycar—where there is contact with oil, where temperatures run from minus 65 to plus 300, where take-offs and engine runups cause terrific strains and shattering vibration.

Inside the outboard nacelles on DC-6s and DC-7s, Hycar and steel mounting brackets support the 145 pound weight of cabin pressurizing superchargers like the one shown above. Engineers who designed the brackets picked Hycar American rubber as the material that would stand up to the requirements of the job. They made a rubber sandwich of

Hycar and steel, shaped it into strong, vibration-absorbing mountings which can take the shear, torque, and compression forces of at least 2000 hours of engine operation.

Products and parts made from Hycar retain their flexibility and strength through wide temperature ranges. They resist abrasive and chemical action. They continue to meet operational requirements even though subject to constant contact with gas and oil.

Hycar is noted, too, for its excellent moldability, permitting manufacture to close tolerances and rigid specifications. For helpful information about what Hycar can do for

you in your own operations, please write Dept. CA-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
 A Division of The B. F. Goodrich Company

Hycar
Reg. U. S. Pat. Off.
American Rubber

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

EVOLUTION OF MULT-AU-MATIC PROGRESS

Since 1914 the Bullard Mult-Au-Matic has reflected engineering and design progress required to fulfill industry's needs — until today, the Type "L", is the optimum for machines of its type.

Here are some of its features...

CONTROL SYSTEM

Advanced design of electro-hydraulic controls provide a readily accessible and simple control system for both Set-Up and Automatic machine operation.

FEED MECHANISM

Completely new screw type feed works insures smooth constant rate of advance of tool slides through any desired part of a 16" stroke with 81 feed changes ranging from .0025 to .0625.

SELECTIVE SPINDLE SPEEDS

Range from 35 r.p.m. to 1,000 r.p.m. at each station providing the correct cutting speed to suit the specified operation.

CARRIER INDEX

The new indexing mechanism with improved carrier column bearing permits faster index of spindle carrier thereby reducing time between cuts. New design index mechanism registers and locks carrier, on successive indexes, to within $\pm .0005$.



PLAN TO SEE OUR
EXHIBIT AT . . .

THE
MACHINE TOOL
SHOW
CHICAGO, ILL.
SEPT. 8-17, 1955
INTERNATIONAL ARCHITECTURE



WE INVITE YOUR INQUIRIES
CALL OR WRITE YOUR NEAREST
BULLARD SALES OFFICE,
DISTRIBUTOR OR . . .

MULT-AU-MATIC TYPE "L"

Available in these sizes
10" with 6, 8, 12 or 16 spindles; 14" and 18" with 6 or 8 spindles.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

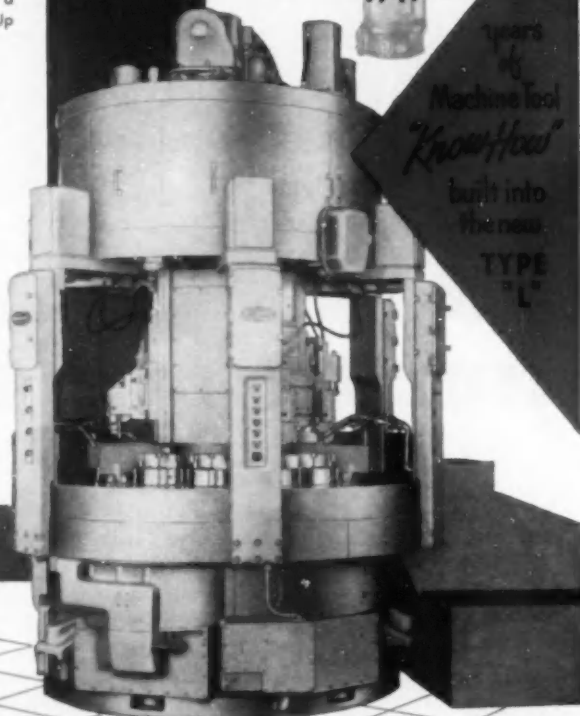
1914

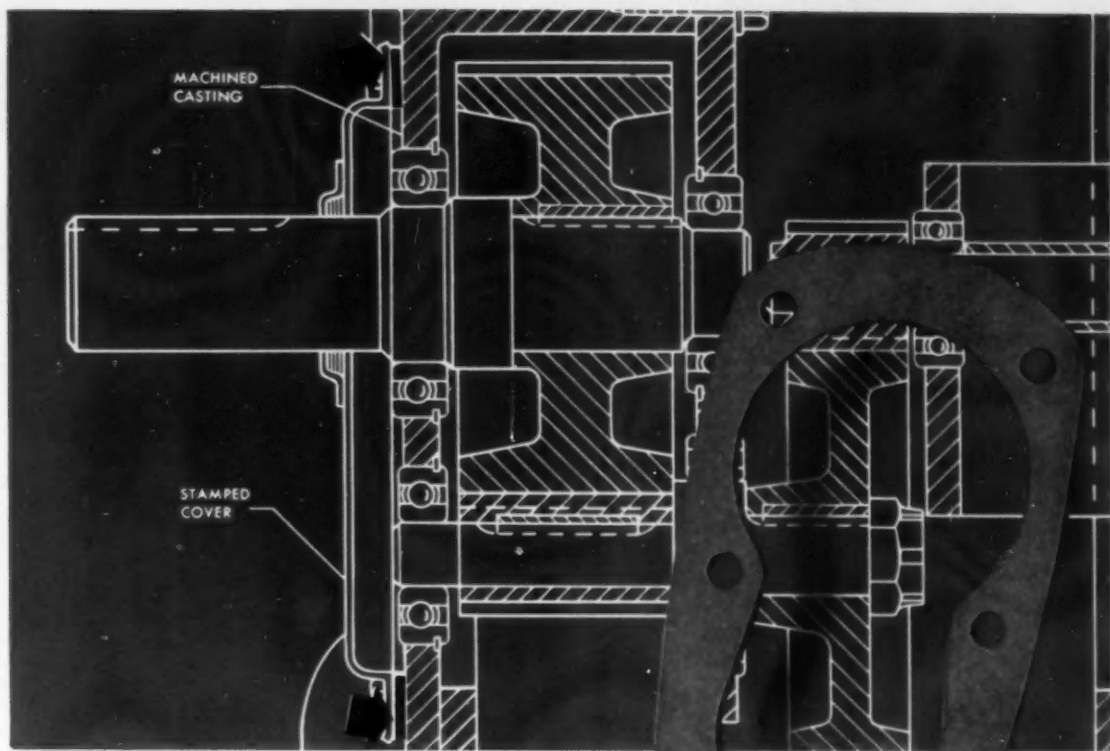
1919

1930

1947

Years of
Machine Tool
"Know-How"
built into
the new
TYPE
"L"





improved fiber gasket

stops bolt torque loss, ends cover plate leakage

Customers were complaining that frequent tightening of bolts was necessary to prevent oil leaks at the cover plate of a motor speed reducer. The manufacturer learned that the molded seal between the cover plate and gear housing flowed under pressure and permitted oil to leak. The situation was especially serious since many of the speed reducers were used in food processing equipment where even slight oil leaks could not be tolerated.

By changing from a cast metal to a stamped face plate and using a fiber gasket, the manufacturer hoped to reduce torque loss. But when he tested several conventional fiber materials in the new joint, each one in time lost its saturant, shrank, and leaked.

An efficient seal was found, however, when Armstrong CS-301 Accopac® fiber sheet was used. This low-cost gasket material retained its non-extractable

latex binder . . . it did not shrink or leak. And its excellent kickback maintained bolt torque.

The dependability of Armstrong Accopac helped this manufacturer find an economical solution to a serious problem. Possibly it can do the same for you.

FREE 24-PAGE MANUAL—For data on Accopac and facts on Armstrong synthetic rubber, cork composition, and cork-and-rubber, look for "Armstrong Gasket Materials" in Sweet's product design file. For your own copy, write Armstrong Cork Company, Industrial Div., 7006 Imperial Ave., Lancaster, Pa. When you order from your local gasket fabricator, be sure to specify Armstrong Gasket Materials.

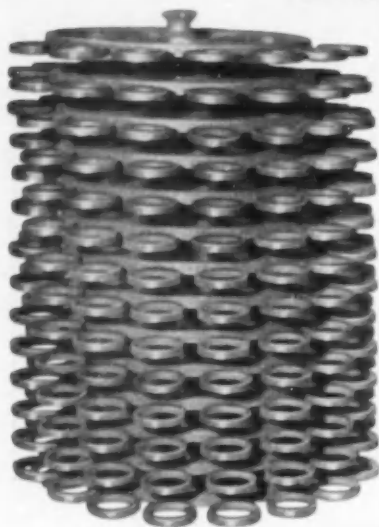


Armstrong Accopac

... used wherever performance counts

Solid Eatonite Valve Seat Inserts

**Heat Resistant
Corrosion Resistant
Wear Resistant**



*Individually Cast to Provide
Dense, Non-Porous Structure.*



For engines in heavy-duty service, where high operating temperatures are encountered over extended periods of time, valve seat inserts cast in solid Eatonite pay for themselves many times over. The combination of Eatonite Valve Seat Inserts and Eatonite-Faced Valves virtually eliminates valve failure caused by prolonged operation at excessive temperatures, and maintains a high level of engine output. Available for all types of engines.

EATON MANUFACTURING COMPANY

General Offices: CLEVELAND, OHIO

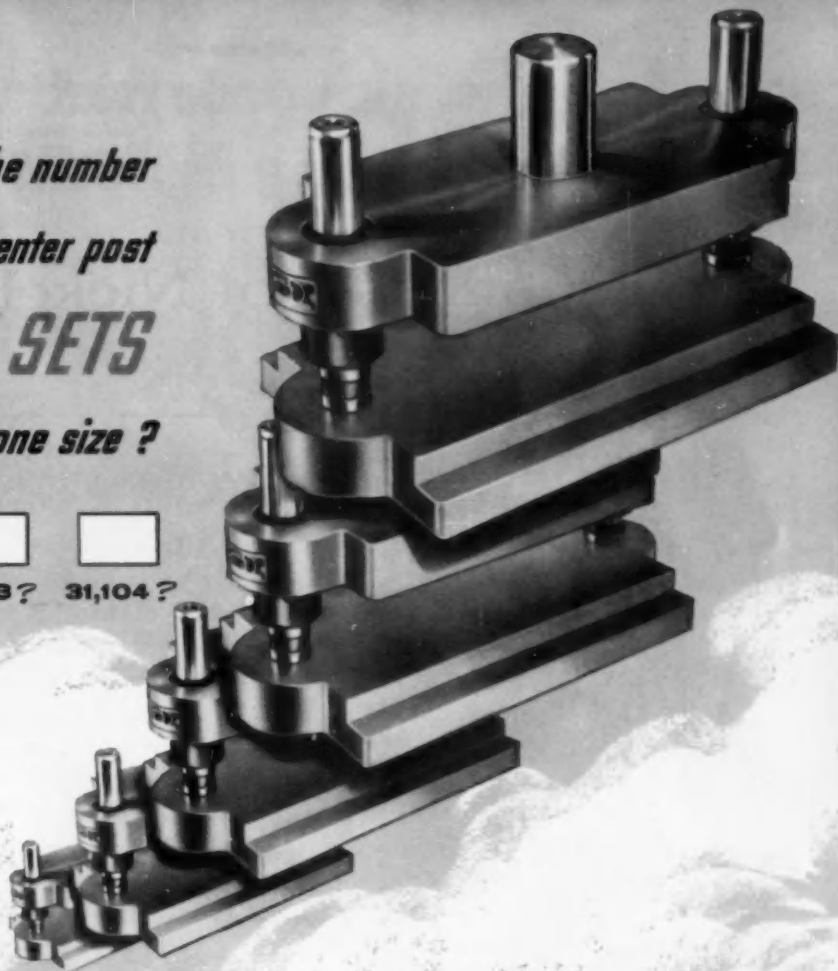
SAGINAW DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN



PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater-Defroster Units • Snap Rings • Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

*can you guess the number
of different center post
DANLY DIE SETS
in stock—in just one size ?*

☐ 67 ? ☐ 575 ? ☐ 1433 ? ☐ 31,104 ?



3 different punch
holder thicknesses



3 different die
shoe thicknesses



6 shank size
variations



4 bushing type
variations



3 different material
combinations



16 guide post lengths
in each of
3 different styles
to choose from

If you guessed 31,104 different standard center post Danly Die Sets in just one size . . . then you were right! Simply multiply together all of the variation possibilities shown in a Danly Catalog for a 12x12 standard center post precision Danly Die Set, and you'll get this remarkable figure. Even more remarkable is the fact that *all* of these variations are cataloged and *stocked* in every Danly Branch.

Just how does this benefit you? This almost unlimited variety of Standard Danly Die Sets in stock at your Danly Branch is your assurance that you can always get the die set you want . . . *when* you want it. That's important in saving tooling time. So remember, when you want the best in die sets—*fast*—the place to call is your local Danly Branch.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

Choose the Danly Branch closest to you:

BUFFALO 7
1807 Elmwood Avenue

CHICAGO 50
2100 S. Laramie Avenue

CLEVELAND 14
1550 East 33rd Street

DAYTON 7
3196 Delphos Avenue

DETROIT 16
1549 Temple Avenue

GRAND RAPIDS
113 Michigan Street, N.W.

INDIANAPOLIS 4
5 West 10th Street

LONG ISLAND CITY 1
47-28 37th Street

LOS ANGELES 54
Ducommun Metals & Supply Co.,
4890 South Alameda

MILWAUKEE 2
111 E. Wisconsin Avenue

PHILADELPHIA 40
511 W. Courtland Street

ROCHESTER 6
33 Rutter Street

ST. LOUIS 8
3740 Washington Blvd.

SYRACUSE 4
2005 West Genesee Street

DANLY

DIE SETS . . .
STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

This is the ninth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

The Effect of Nickel in Alloy Steels

Each element in an alloy steel has its own particular job to do, and each is included with a special purpose in mind. What are some of the reasons, say, for using nickel, chromium, molybdenum, vanadium, and other components that appear in the various analyses? The elements in any alloy steel work both individually and as a team. What does each one do? In this and subsequent discussions we shall try to answer these questions, beginning with nickel, one of the fundamental alloying elements.

Nickel increases toughness and resistance to impact, particularly at low temperatures; lessens distortion in quenching; improves corrosion-resistance. It lowers the critical temperatures of steel and widens the temperature range for successful heat-treatment.

Nickel steels are particularly suitable for case-hardened parts, such as aircraft-engine gears and roller bearings. Such steels provide strong, tough, wear-resistant cases and also ductile core properties.

Advantages imparted by nickel are not restricted to quenched-and-tempered steels. Nickel often permits given strength levels to be obtained at considerably lower carbon contents, thereby markedly in-

creasing toughness, plasticity, and fatigue-resistance. Nickel steels are therefore highly suitable for applications where liquid quenching is not employed, such as high-strength structural steels used in the as-rolled condition or heavy forgings not adapted to quenching. Products of this nature must develop superior properties after nothing more severe than air-quenching treatments.

If you would like to know more about nickel steels, or need information about other types of alloy steels, please feel free to consult with Bethlehem's metallurgists. These technicians will gladly advise you regarding analyses, heat-treating, machinability, etc. You are invited to make use of their services whenever you need assistance.

And may we remind you, too, that Bethlehem makes all AISI standard alloy steels, as well as special-analysis steels and the full range of carbon grades. We are always in a position to meet your needs promptly and fully.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast, Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



BETHLEHEM STEEL

Lab-tested thermocouple wire *available through your*

HSM

HONEYWELL SUPPLIES MAN



CONNECT a thermocouple with only $\pm 1\%$ accuracy to an instrument with accuracy of $\pm \frac{1}{4}\%$. . . and how closely can you measure? The answer is simple. Overall accuracy *can't* be any better than your thermocouple.

To guarantee you consistent accuracy in your temperature detecting elements, Honeywell maintains a fully equipped wire checking laboratory. Here every spool of thermocouple or extension wire is tested against standard wires that have

been certified by the National Bureau of Standards. Checks are made at numerous points throughout the temperature range of the calibration in which the wire will be used. Every spool of wire meets rigid standards before it is accepted. Calibration figures are tagged on each spool.

The result of this laboratory control is that every order of Brown thermocouple or extension wire you receive can be counted on to deliver identical standards of high precision.

Ask your Honeywell Supplies Man

to give you complete facts about Brown thermocouple and extension wires . . . and to tell you how the HSM Plan can bring you new convenience and economy in all your purchasing of pyrometer supplies. Call him today at your local Honeywell office . . . as near to you as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● REFERENCE DATA:

Write for Pyrometer Supplies Buyers' Guide No. 100-B.



MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

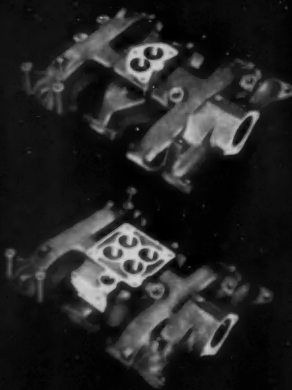
First in Controls

Another Transfer-matic by Cross

**Mills, Drills,
Bores, Taps,
2 and 4 Barrel
Intake Manifolds**



- ★ Rough and finish mills carburetor pad; mills choke pad (4 barrel only); bores carburetor port holes; drills and chamfers all holes (except 3 holes in water outlet pad); and taps all holes.
- ★ 140 pieces per hour at 100% efficiency.
- ★ Initial part location from port openings.
- ★ Push-button changeover from 2 to 4 barrel carburetor.
- ★ 13 stations; 1 loading, 11 working, 1 unloading.
- ★ Lift-and-carry type transfer mechanism.
- ★ Pre-set tooling throughout.
- ★ Other features: construction to J.I.C. standards; complete interchangeability of all standard and special parts for easy maintenance; hardened and ground ways; drag chain type chip conveyor.



Established 1898

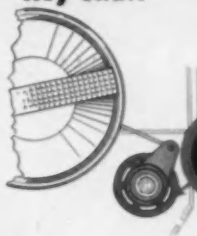
THE **CROSS** CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

5 Waldes Truarc Rings simplify assembly, eliminate parts, bring big over-all savings to new design low-cost camera

Anscoflex II Camera



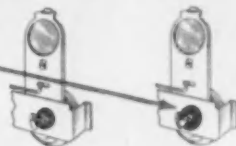
Key Shaft



Parts originally designed for self-locking Truarc ring (series 5105). Some cameras in the past had brass cup staked to the body. At times staking operation cracked the plastic, resulting in loss of expensive part.

Portrait and Filter Lens Knob Assemblies

Old way: Knob with plastic shaft used washer and heat forming operation that flattened the plastic pin and locked the pivot in position.



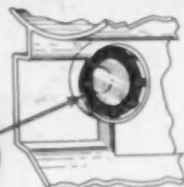
Truarc way: Molded plastic knob with pin is easily and quickly held by a Truarc self-locking ring (series 5105). No groove is necessary. Washer is eliminated and it is possible to remove ring if necessary without damage to knob.

Winding Knob

Old way: With screw and washer design, it was necessary to disassemble entire camera to remove screw which secured winding knob. Self-tapping screw sometimes failed to secure knob, produced excessive end play.



Truarc way: Truarc "E" ring (series 5133) allows removal of winding knob without major disassembly of camera, reducing repair time. Use of stacked rings and Truarc applicator saved \$10.40 per M on labor. Material saving: \$2.29 per M.

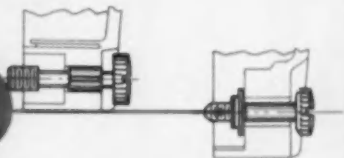


Rear Lens

Parts originally designed for self-locking Truarc ring (series 5005). Some cameras in the past had glass element secured by heat forming tabs from plastic body. Loose or chipped elements resulted in loss of both parts.

Flash-Gun Case Assembly

Old way: In the original design a sleeve was wrapped around neck of screw and pressed into hole of plastic cover. Close working areas made assembly difficult and required extra operation to lock ring into place.



Truarc way: Series 5133 E-Ring snaps onto unthreaded shank of screw quickly, needs no special groove. Labor saving \$7.06/M.

Ansco, Binghamton, N. Y., uses the latest technical advances in construction to produce an economical, easy-to-use reflex camera. 5 Waldes Truarc Rings are used in this new design to save material and labor costs, eliminate parts, simplify assembly and reduce rejects.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble and disassemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 different sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

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For precision internal grooving and undercutting... Waldes Truarc Grooving Tool!



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RETAINING RINGS

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Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
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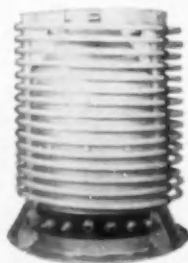
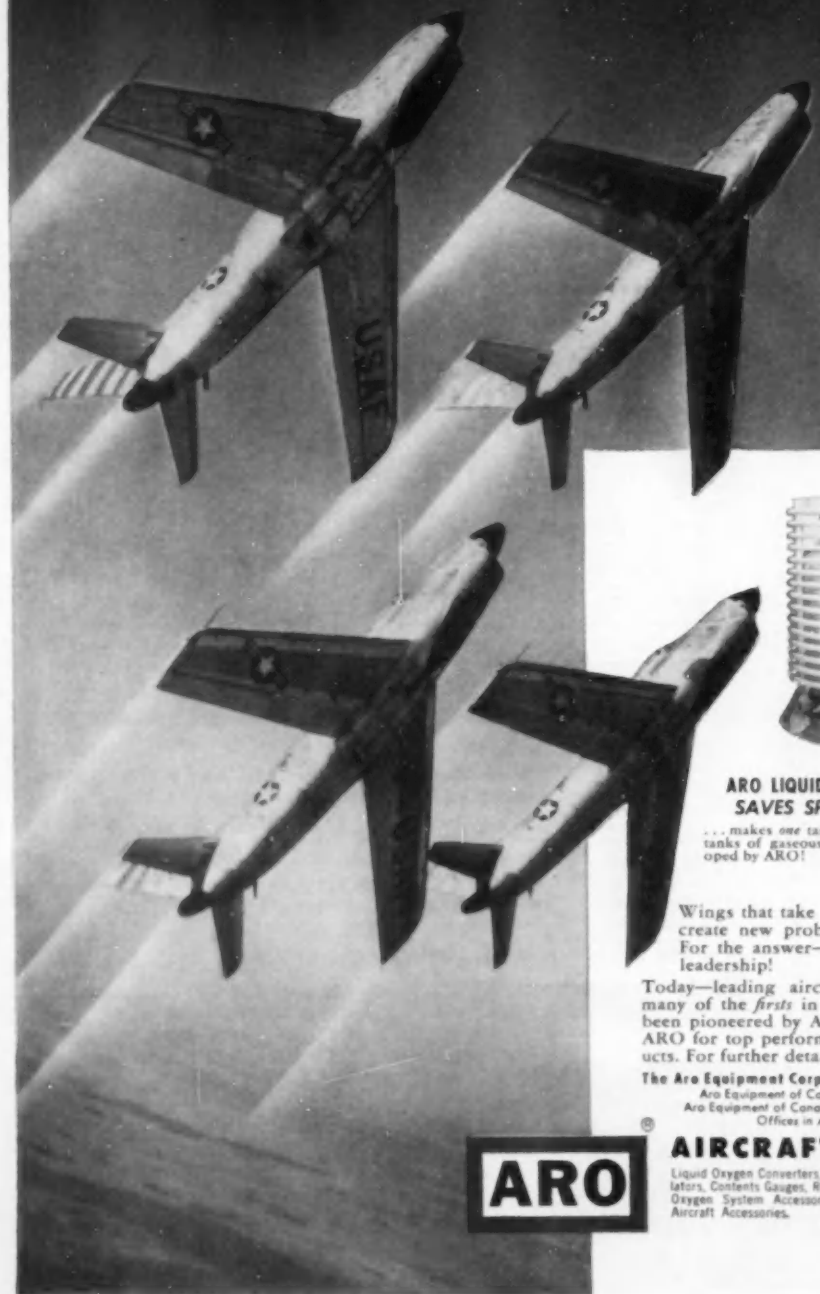
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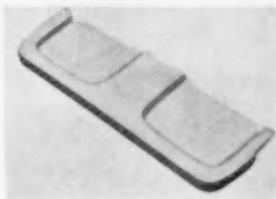
On every point—style, luxurious appearance, comfort and room—AIRFOAM seat-units can be invaluable manufacturing and sales aids. Let us tell you about our latest developments.

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AIRFOAM makes interiors roomier, more luxurious



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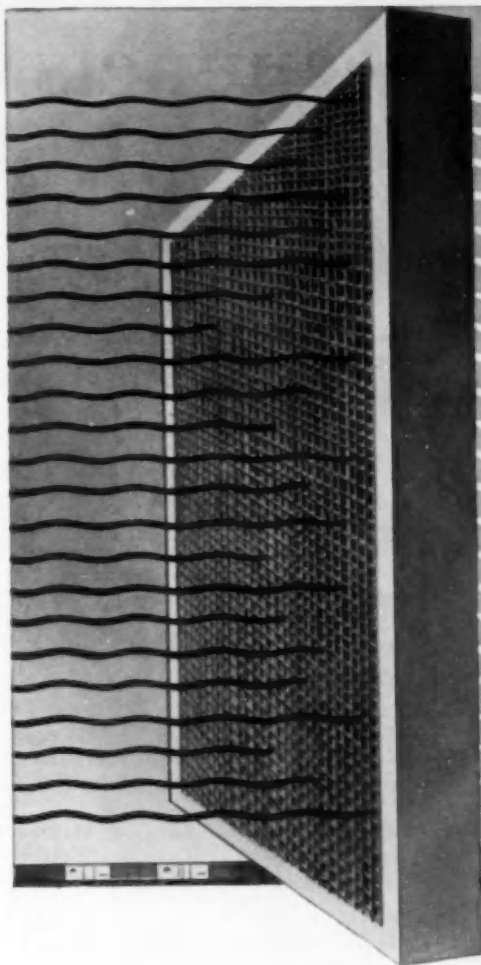
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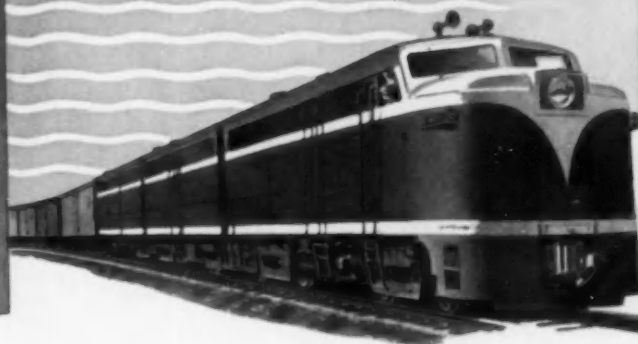
HARVEY, ILLINOIS

DETROIT, MICHIGAN



HOW SPECIAL WIRE CLOTH

*helps big engines
breathe easier,
work better*



● Keeping harmful grit and dirt out of the lungs of big engines, like locomotive diesels, is no small problem. Determined to do the job better than ever before, a leading filter manufacturer turned to the *Reynolds Wire Division* of National-Standard for a special wire cloth that would trap all the dirt and still let such engines breathe the terrific volume of air they need.

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Are they under-designed...

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- **The wide selection of materials** developed by Mallory metallurgical research encompasses practically every kind of contact service condition.
- **Standard designs** can often be recommended for standard application conditions... at sizable savings to you.
- **Special designs** are engineered by a staff which has the knowledge gained during thirty years of contact development.
- **Economical fabrication** of contacts and complete contact assemblies, in Mallory's manufacturing department, can save you money and simplify your own production.

For a consultation on your own contact problems, or for a copy of the Mallory Contact Catalog, write or call Mallory today.

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these thread rolling production pictures*

would be good in any shop!

now look even better!

Report from Plant #1
"This shop has been rolling
3/16"-16 threads continuously
for two months - at
2000 rpm. Still on
first set of rolls -
350,000 pieces to date."

Report from Plant #2
"Have three machines rolling
7/16"-20 threads on G114 steel studs -
'Close to a million' so far - and
rolls have not been turned
around."

(*Thread Rolls are reversible, having a
lead of 1/16 to 1/8 threads on both sides)

These facts show that National Acme (Pete's)
SP-OPENING Thread Rolling Heads
can make a steady, day-in, day-out
flow of threaded pieces into the job.
And when you consider that these thread rolling
heads give you better threads - with smoother, more
wear resistant surfaces, and with no crushing of the

metal - aren't you missing a lot if you don't get them
to the test on your threading job?
Wherever the work calls for threading machines
work from the end, there's no faster, better way than
to "roll-on" with a National Acme (Pete's) roll
opening head.
We'll be glad (and we think you will be too) if you
ask us to prove that statement. Send sample or blue-
print for our recommendation - or ask our repre-
sentative to call.
May we send you a copy of Catalog #22-225 T

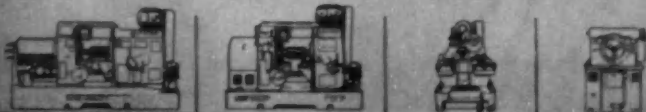
National Acme (Pete's) Thread Rolling
Heads are used on automatic, turret or
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SP-OPENING heads which operate like
a die head, except that threading rolls
are used instead of dies. And they
are used instead of dies. And they
operate at HIGH SPEED-STEEL TURNING
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Necessity created the Pesco DC and high frequency AC Electric Motors. Because Pesco could not get motors to meet its strict requirements, you can now buy better motors for your special applications.

Pesco engineered and developed this line of 1/100 to 11 horsepower motors to answer the need for completely dependable operation under critical conditions. Pesco Electric Motors assure optimum performance and efficiency throughout a long service life. They combine maximum power with minimum size and weight, yet withstand rugged environmental extremes. These motors are now available to you.

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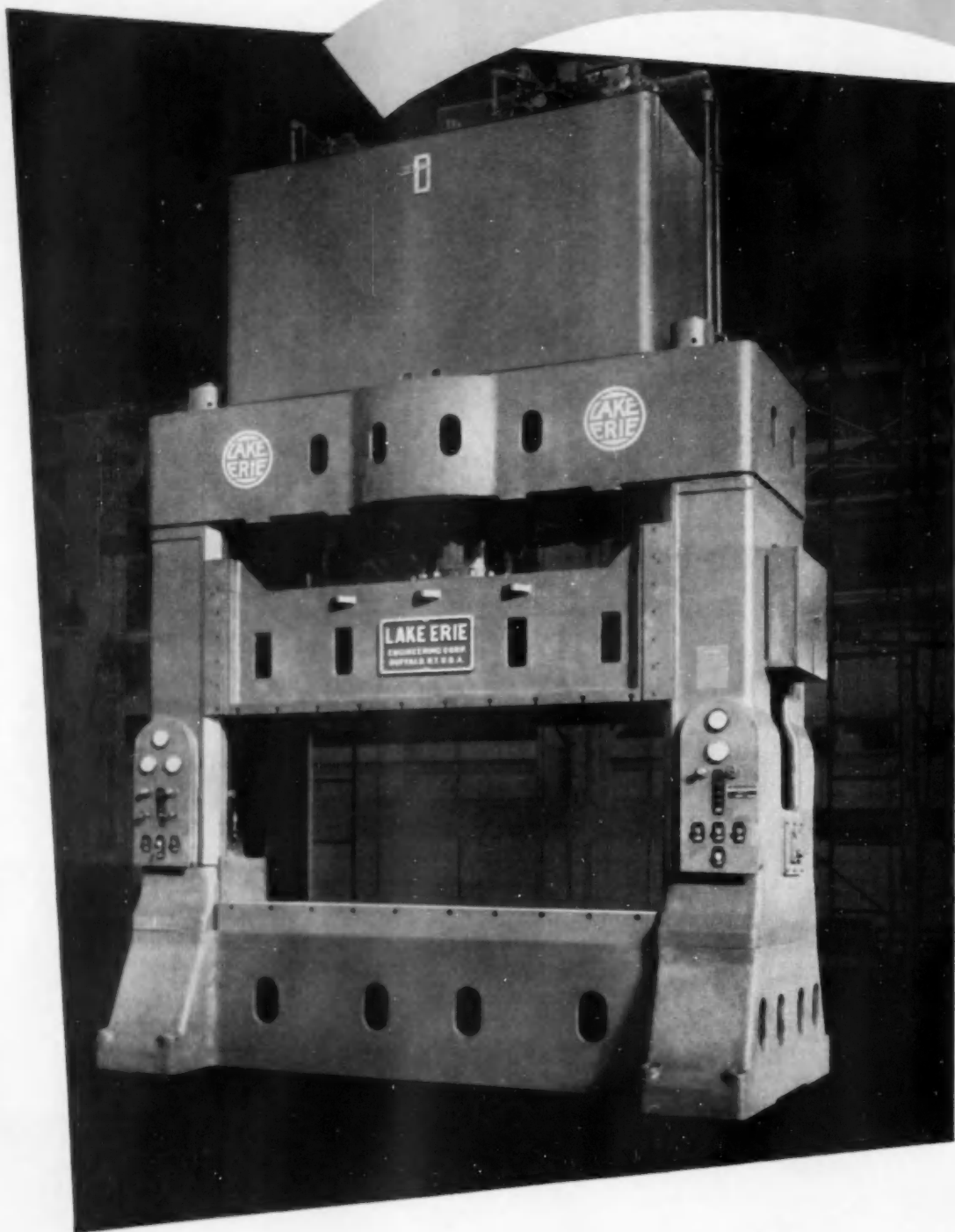
Pesco high quality motors have many features not found in ordinary motors . . . such as dynamically balanced rotors, high strength alloy shafts, extremely tight windings, advanced-design brush rigging, multiple impregnations, brush material selected for specific use, high capacity sealed ball bearings and special insulations. If you are looking for a good source for special purpose electric motors, look to Pesco.

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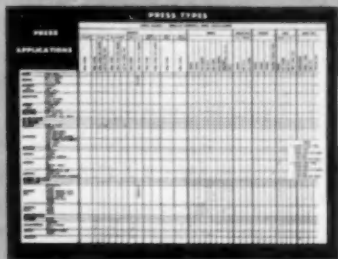
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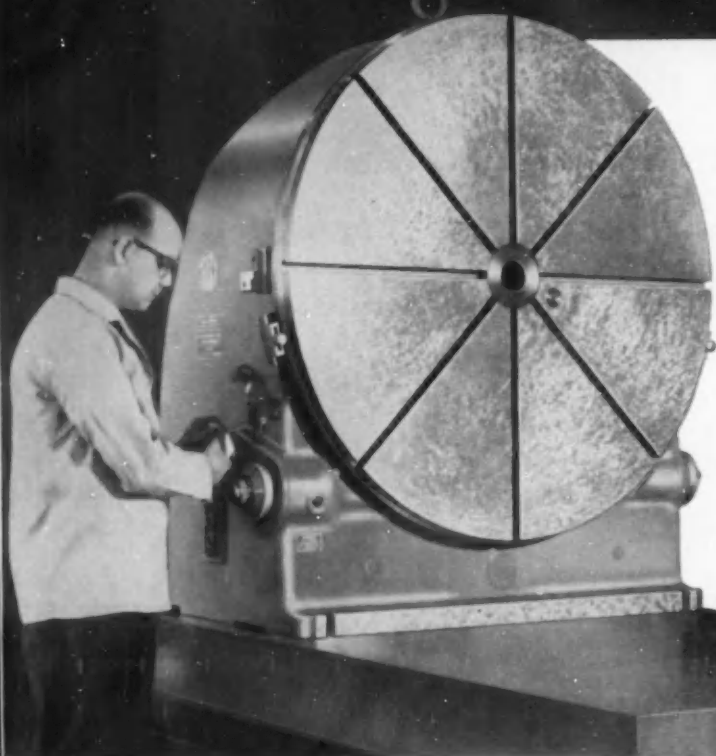
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This rugged, new Rotary Table is designed especially for inspecting large, heavy work pieces . . . such as aircraft parts, machine elements, jigs, fixtures and other precision products . . . with speed, ease and accuracy. It can also be used to provide precise work location on heavy equipment for boring, face milling and other machining operations.

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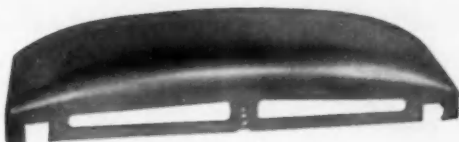
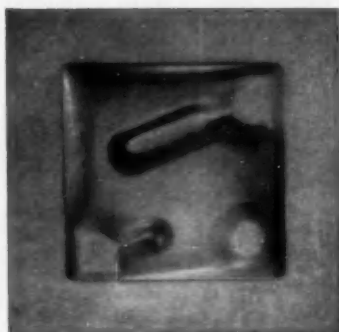
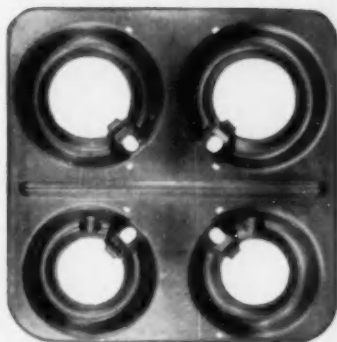
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Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

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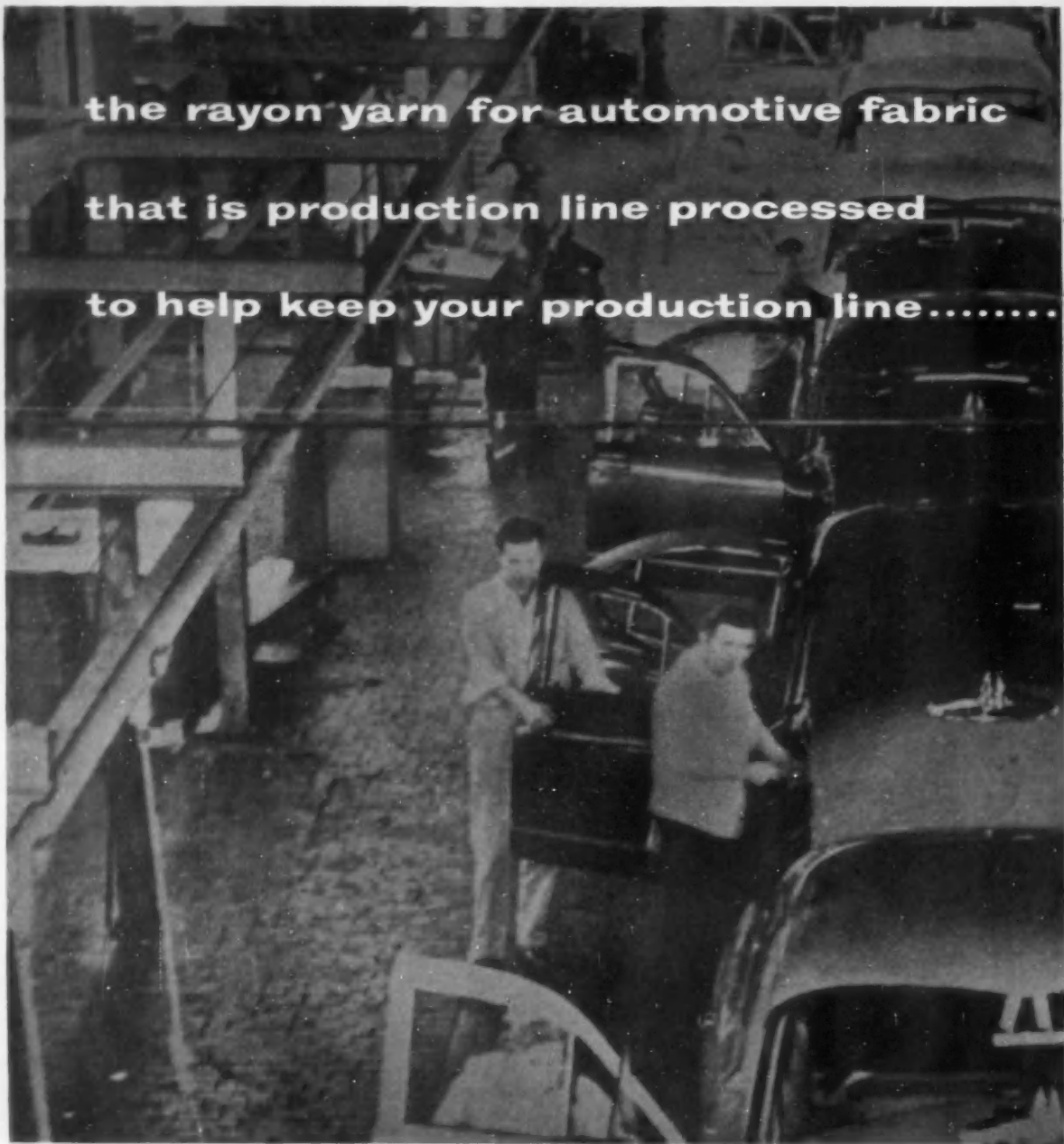
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that is production line processed
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You know how variations in quality or color in interior trim fabrics can result in costly interruption of your assembly line production. When using rayon, the way to insure continuous assembly line production is to specify the use of IRC Continuous Process yarn.

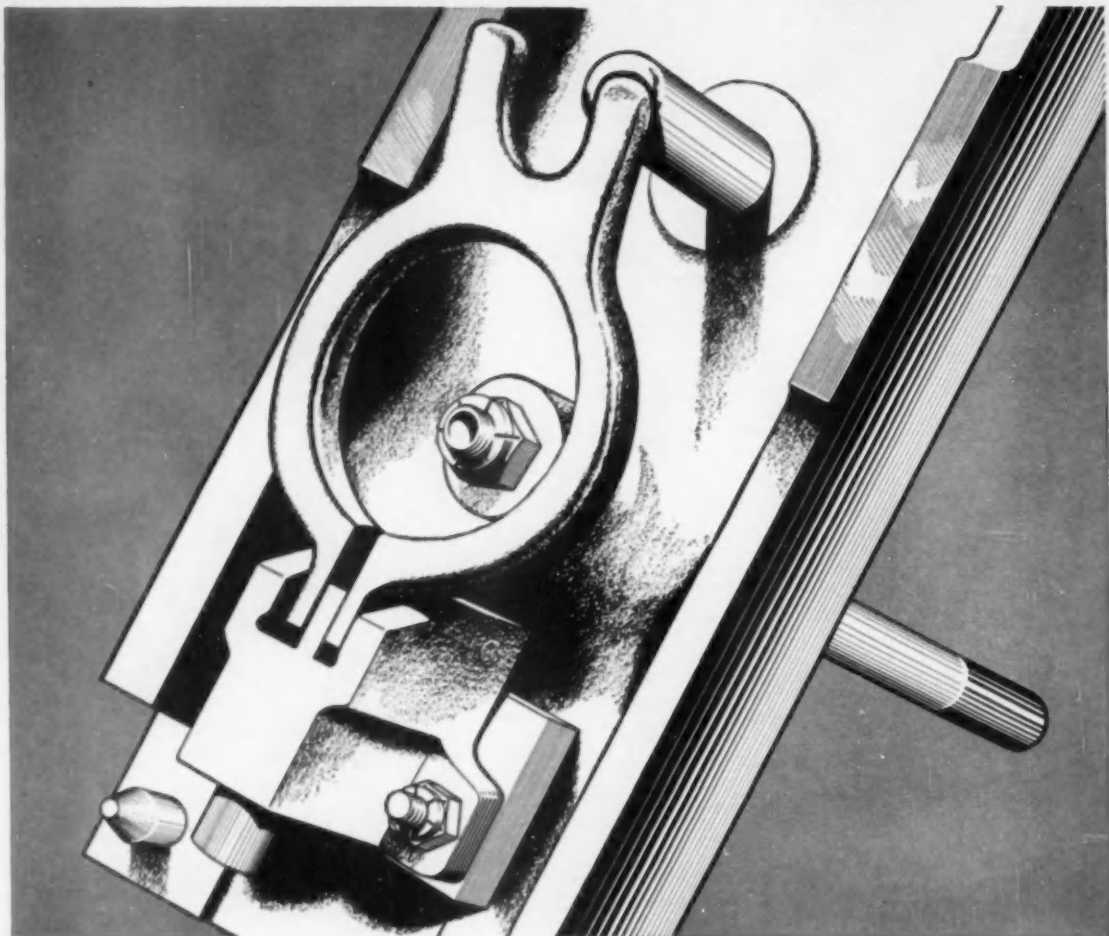
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FLEXLOCs were put on this unit after a number of other locknuts had failed to keep the spindles tight. Even the high humidity, extreme vibration, and presence of lint and grease have not loosened the FLEXLOCs.

FLEXLOC Self-Locking Nuts—one piece, all metal—are available in a full range of sizes in any quantity. Standard FLEXLOCs are stocked by leading industrial distributors everywhere. Write for Bulletin 866 and samples. STANDARD PRESSED STEEL CO., Jenkintown 53, Pa.

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Standard FLEXLOCs are not affected by moisture, oil, dirt or grit. They lock efficiently under all conditions, regardless of the vibration encountered.



FLEXLOC
LOCKNUT DIVISION

SPS

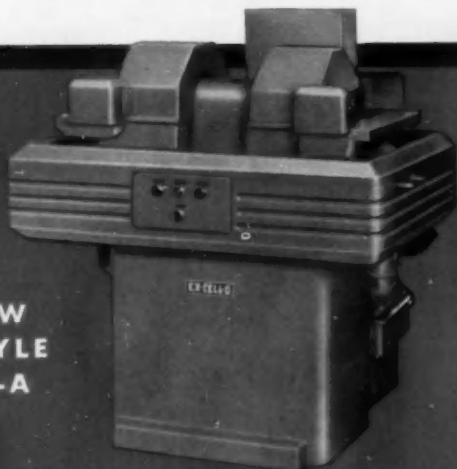
JENKINTOWN PENNSYLVANIA

AUTOMOTIVE INDUSTRIES, June 1, 1955



NEW STYLE 46-D

For accurate reconditioning of all types of single-point boring, turning and facing tools; also dovetail and straight shank form tools. This grinder has a new in-built motor spindle designed for maximum rigidity. Wheels are mounted on the spindle shaft. Ball bearings are lifetime lubricated. Tool rest tables are at a comfortable height for operator convenience.



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STYLE
49-A**

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This new grinder has a new coolant system; is easier to clean and stays clean longer; troughs and coolant return lines are bigger, more accessible, and a settling tank is added.

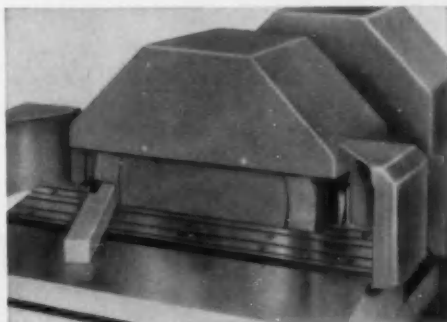
There's an Ex-Cell-O Grinder to suit the needs of every shop, large or small. For new low prices on the above models, and for data on Ex-Cell-O's complete tool grinder line, write to Detroit, or call your local Ex-Cell-O Representative.



55-2

NEW **EX-CELL-O CARBIDE TOOL GRINDERS**

STYLES 46-D AND 49-A



LARGE TOOL REST TABLES

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Wheel spindle is permanently lubricated.

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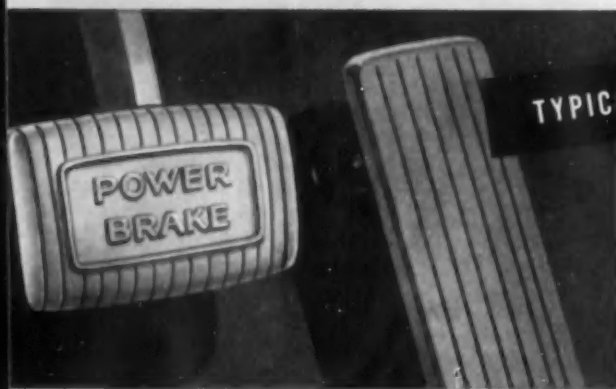
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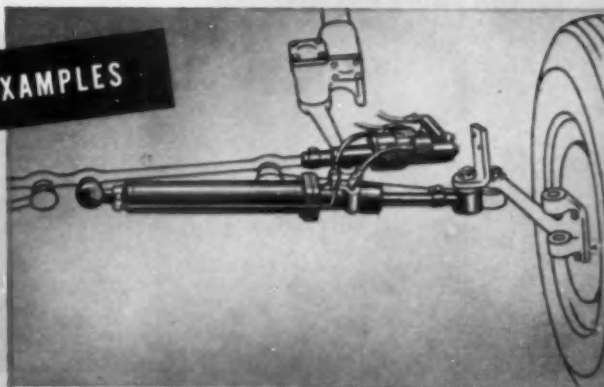
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High Spots of This Issue

★ 3000 Passenger Car Chassis Frames per Day

Incorporated in the vastness of the Budd Co. Red Lion plant at Philadelphia is one of the most modern and unique car frame assembly lines. Designed especially for the production of Chevrolet units, its operations are described here. Page 48.

★ Exhaust Valve Corrosion in Gasoline Engines

Considering the chemical environment in which they operate, it is not surprising that exhaust valves in gasoline engines are subject to corrosion. The authors examine the various types and suggest steps to correct the deficiency. Page 52.

★ What GM Expects of the Machine Tool Builder

In this straight-from-the-shoulder report, the writer expresses top management views of the needs and desires of General Motors regarding machine tools. Woven in is a view of GM's continual product improvement efforts. Page 60.

★ Automatic Painting of Passenger Cars

Incredible though it may seem, a single spray booth at the Los Angeles Chrysler plant can spray 94 different colors. This phenomenon and many others equally impressive are described and illustrated in a graphic plant tour. Page 64.

★ Automated Setup for Handling of Workpieces at Ford

Output of gears and shafts for tractor transmissions requires exacting procedures at the Ford Highland Park plant. Of particular interest in the whole operation is the extensive use of automatic equipment, as will be seen. Page 68.

★ 43 New Product Items

And Other High Spots, Such As:

Seven lines of cars on one assembly line; experimental race-type car; new methods for valve tappet production; Air Force heavy press program; Miehle-Dexter turbocharger; new Communist vehicles; piston ring castings improved; effects of rain erosion on supersonic surfaces; Bristol BE 25 turboprop.

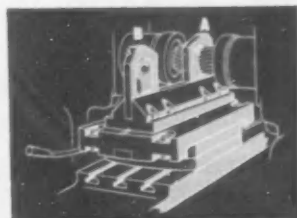
Complete Table of Contents, Page 3
Automotive and Aviation News, Page 33

AUTOMOTIVE INDUSTRIES COVERS—
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
• BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY •
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

There's No Catch to this

Something for Nothing

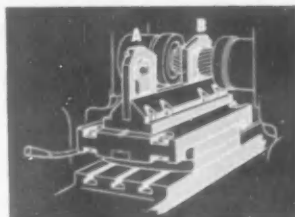
SETUP



Milling the part in fixture A. Plenty of time to reload fixture B.



Swiveling the Index Base table at end of cycle.



Milling the part in fixture B. Plenty of time to reload fixture A.

CINCINNATI No. 2-24 DUPLEX AUTOMATIC MILLING MACHINE

Milling two sides simultaneously, on cast iron pump parts at the rate of 60 per hour, employing the index base method of milling on a Cincinnati No. 2-24 Automatic.

Cost wise, the all-Cincinnati equipment illustrated here actually does give you something for nothing. The trick is accomplished with a setup that takes advantage of the free time during the feeding stroke of the table. The above drawings show how it works. ¶ A CINCINNATI No. 2-24 Duplex Automatic Milling Machine is equipped with a Cincinnati Index Base (standard attachment) for the operation of milling two sides of pump parts. The entire production cycle proceeds along the following pattern: at the completion of the milling cut, the table automatically returns to starting position, the operator indexes the Index Base table 180°, and the cycle automatically repeats. Notice that there's no time allowance for handling the work. This item, usually a considerable cost factor, is

free; accomplished while the cutters are at work. ¶ This is a typical example of cost reduction by CINCINNATI No. 2-24 Automatic Milling Machines. They have many features of value in operating at rock-bottom costs:

Cycle selector unit . . . hundreds of variations; changed in a minute or less. Automatic two-way table cycles. Single lever table control. Automatic spindle stop. Automatic backlash eliminator.

How do the foregoing features strike you as potential cost reducers in your shop? You can get the entire No. 2-24 specifications and illustrated advantages by writing for catalog No. M-1760-1.

**THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO**

CINCINNATI



MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 112, No. 11

June 1, 1955

Ford to Start Making More of Its Own Parts

Ford Motor Co. will start making more of its own automotive hardware next year. The company did not name specific items, but it indicated that a "variety" of parts would be made for the first time at its new parts manufacturing plant presently under construction near Sandusky, O.

The one-story plant, the eighth to be operated by the Parts and Equipment Manufacturing Div., will contain 690,000 sq ft of space. A 30,000 sq ft office building will be constructed adjacent to the manufacturing unit. The plant, scheduled to be completed by July, 1956, will employ 2500 persons.

AMC Asks Eight Economists For Advice on Annual Wage

American Motors' decision to ask eight leading economists for advice on the guaranteed annual wage is particularly significant to automotive suppliers. Although the group will analyze AMC's particular problems, it will give other companies an idea of how their operations would be affected should the UAW win its demand for the annual wage.

Biggest factor under study will be whether the plan will achieve greater employment stability. The decision to invite the economists was not made until after the union extended AMC's contract expiration to Aug. 12.

Merger of Federal-Mogul, Bower Voted by Directors

Merger of Bower Roller Bearing Co. with Federal-Mogul Corp., two old-time bearing manufacturers, has been proposed by directors of both firms as a logical move. Federal-Mogul's large distribution system, combined with Bower's manufacturing facilities, would provide the company with more product diversifica-



SLEEK MERCEDES-BENZ 300-SLR SPORTS MODEL

The new Mercedes-Benz 300 SLR sports model has a straight eight-cylinder engine of 183 cu in. piston displacement. While there is much similarity between the racing and the sports model, the latter has a wider frame of rigid steel tube construction. Suspension is by torsion bars with telescopic shock absorbers. Net weight is 1780 lb for the two-seater with light-alloy body shown here.

tion and enlarge its markets. Since 1950 Federal-Mogul has merchandised and distributed Bower products.

If the merger is approved by stockholders, Federal-Mogul would change its name to Federal-Mogul-Bower Bearings, Inc., with Bower as a separate division. Federal-Mogul plans to increase authorized \$5 par value stock from 1.2 million to 3 million shares, and to exchange one million shares of Federal-Mogul-Bower stock for Bower's outstanding 900,000 shares. The companies had a combined business of nearly \$72 million last year.

Federal-Mogul for many years has made sleeve bearings, thrust washers and bushings. Last year the company entered the ball bearing field with the acquisition of Bearings Company of America, which is now operating as a division, and has been expanding its distribution system. The company now is enlarging its central parts warehouse in Coldwater, Mich., which, when completed, will increase space there by 50 per cent to 123,000 sq ft. The plant addition is scheduled for completion by the end of this summer.

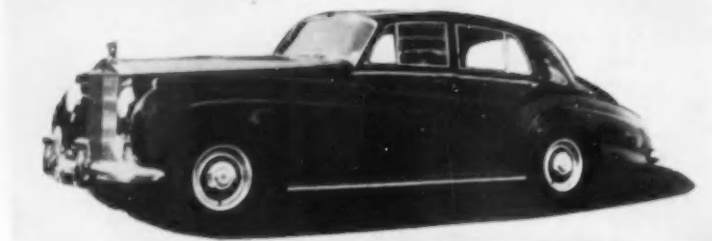
S-P's First Quarter Loss Amounts to \$5.6 Million

Despite its first profit in March since it became a corporate firm last October, Studebaker-Packard Corp. suffered a net loss of \$5.6 million for the first quarter of this year. Net sales billed to customers for the period totaled \$152 million. No comparison can be made with last year's sales and earnings, since Packard and Studebaker operated independently. The company did not take any Federal tax credit for the three months.

Goodyear Sales Up 22% In First Three Months

Goodyear Tire & Rubber Co. sales increased in the first three months to a record high, but profits dropped slightly under last year. Surpassing the previous record in 1953 by about \$30 million, sales topped \$333 million, 22 per cent higher than in the 1954 period. Profits dipped to approximately \$12 million from \$12.47 million for the same period of 1954.

News of the AUTOMOTIVE



TWO NEW ROLLS-ROYCE MODELS MAKE DEBUT

The new and recently announced (see *AI*, May 15, p. 112) Rolls-Royce Silver Cloud and Bentley "S" series are identical except for their front-end styling. Principal features are a new chassis frame and suspension, increased power, and improved steering and brakes. The six-cylinder engine has a piston displacement of 298 cu in. Stroke remains at 4.48 in., although the bore has been enlarged to 3.74 in. Compression ratio is 6.75 to 1, but no power rating has been released.

\$6000 Packard Caribbean Goes Into Production

Bidding to regain its former position in the luxury car field, Packard last month introduced the Caribbean convertible, which has been delayed for several months by scheduled production on standard models. Expected to sell for about \$6,000, with initial output held to 1000 units a year, the car features as standard equipment many extras now offered on standard models.

Growth of Clark Equipment Is Pointed Up In Report

Clark Equipment Co.'s annual report to stockholders gives some interesting data on the company's growth during recent years. Although sales last year were down slightly from 1953, Clark's continuing expansion programs are indicative of its optimism about future business.

Last year Clark's earnings climbed to \$5.7 million from \$5.1 million in

1953, despite lower sales, totaling \$91.1 million as against \$112 million the preceding year.

When Clark was established, its original product was twist drills. Today, the company is one of the leading producers of materials-handling and earth-moving equipment. Its automotive division during the past few years has grown rapidly, and its torque converter operations are expanding. The company claims that it can offer the broadest line of torque converters available anywhere.

Clark's facilities include equipment to produce many complex driving mechanisms for trucks, buses, farm tractors and construction equipment. Its Jackson, Mich., plant is one of the best equipped gear cutting and transmission assembly plants in the country. The company's growth in the industrial truck field has been phenomenal. In 1939, for example, Clark produced only 500 lift trucks. Last year the company sold fork lift trucks and other materials-handling equipment to more than 3000 firms.

New Supply Division Formed by Chrysler

Formation by Chrysler Corporation of a new Supply Division, which will embrace four of the company's major components producers in Indiana, is another step in Chrysler's continuing divisionalization program. Although the corporation's other parts-making plants will continue to operate individually for the time being, it is possible that some later may be brought under the new supply division.

The new Supply Division will include Chrysler's two transmission plants in Kokomo, Ind., one of which is under construction, in addition to the automatic transmission plant in Indianapolis, and the New Castle plant, which turns out shock absorbers, and forged and machined parts.

R. S. Bright, who headed three of the Indiana plants formerly operated by the Dodge Division, will serve as general manager of the new Supply Division, reporting directly to L. L. Colbert, Chrysler president, according to present plans.

Further Details Given About New Continental

Several more details have been given by Ford Motor Co. about its new luxury car which is to be introduced by the new Continental Division later this year. The car officially has been designated the "Continental Mark II," indicating a departure from other cars in an attempt to give the new model more prestige. It is felt that such a designation will emphasize basic body design rather than model of any particular year.

The decision to give the car a distinctive name is based on the assumption that the Lincoln Continental, produced between 1940 and 1948, constituted the Continental Mark I series.

Expected to sell for about \$10,000, the new car will feature a hood ornament made of a four-pointed star set on a hollow escutcheon. A crest adapted from the old Continental will appear on the rear of the car. Practically custom-built, the car reportedly will be the first genuine convertible hardtop with the top retracting into a trunk well.

AND AVIATION INDUSTRIES

Tempo of GAW Talks Quickens As Contract Expirations Near

Thousands of small companies in the automotive industries should soon know how their fortunes are to be affected by the guaranteed annual wage drive now under full steam by the UAW-CIO.

At press time, negotiations between Ford and the union were getting down to bedrock, but there still was no indication as to the ultimate outcome. The talks with General Motors were also picking up speed.

The Ford contract was due to expire June 1, but there still was optimism that some kind of a settlement could be worked out to avoid a strike. Sentiment of union members, however, appeared to favor a strike, if deemed necessary. Reports of counter-offers by both Ford and GM were frequent but unverified.

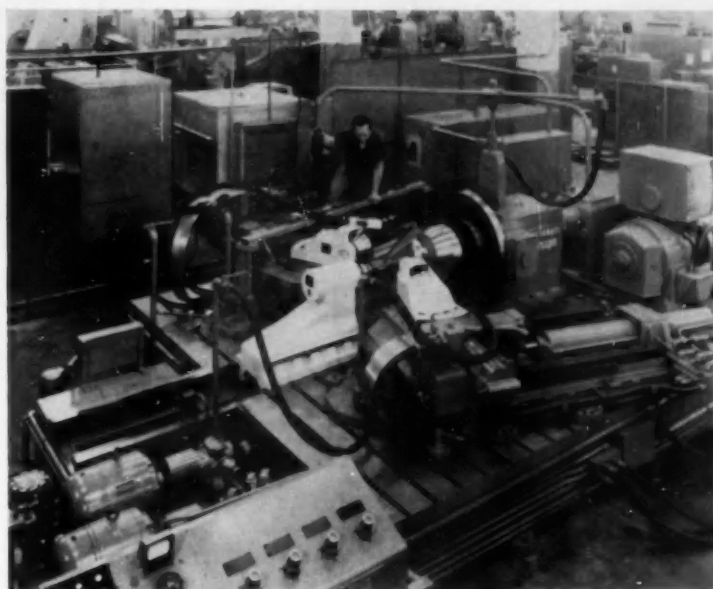
Whether or not the union will require the same commitments from smaller companies that they are seeking from the large concerns is not clear. However, findings by the special committee looking into the effect GAW would have on American Motors may have some bearing on how smaller companies will fare.

There are many thousands of suppliers who would be affected if GAW were to become industry-wide. General Motors alone has 21,000 supplier companies and Ford has 7000. A strike at either one of the big companies would be felt immediately by the smaller concerns, particularly those which devote most of their production to GM or Ford.

Polk Using New Method In Counting Car Sales

A change in the method used by R. L. Polk & Co. for compiling new-car registration figures is expected to provide a more accurate count of automobiles purchased by actual consumers. Under the new plan, which closely parallels practice previous to 1954, all cars registered in dealers' names will be withheld until the car is sold to a retail customer.

The new way of counting registrations seemingly was prompted by the dispute between Chevrolet and Ford



INDUSTRIAL OCTOPUS COLD ROLLS JET PARTS

This sprawling machine in the Cincinnati, O., plant of General Electric Co., is said to be the first of its kind to be acquired by a jet engine manufacturer for cold rolling hollow conical and tubular parts. The hydrospro equipment was developed jointly by the GE Jet Engine Dept. and the Process Machinery Div. of Cincinnati Milling Machine Co. Shown is a sample jet engine turbine shaft being spun on the unit.

over leadership in 1954 sales. Ford claimed first place in sales for 1954 on the basis of net registrations. Chevrolet claims the 1954 sales crown on the basis of total registrations.

For the first three months of this year, Ford shows a lead of nearly 21,000 units over Chevrolet, according to Polk figures. However, the revised counting method was not in effect during that period, and when first quarter figures are adjusted to the new basis, there may be a change in the differential between the two companies.

Navy Contract for Mines Is Awarded to Hudson

Hudson Special Products Div. has been awarded a Navy contract to design and fabricate sea mines, its second defense assignment. Earlier, the division was granted a contract for development of a new retractable wheel utility trailer for the Air Force.

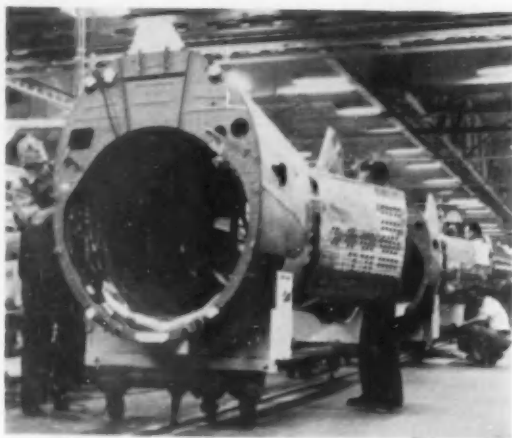
Record Stocks of New Cars May Hold Throughout June

New car stocks climbed to a record high last month (May). At the beginning of May, unsold cars in dealers' hands totaled more than 675,000 units, nearly double the count at the beginning of the year, and all indications point toward a further buildup this month. Last year, between January and May new car stocks rose slightly over 25 per cent.

It is almost certain the stocks will remain high through June at least, since there has been no letup in the sizzling production pace. Most car makers reported new sales records during May, but production schedules more than kept pace to push stocks to a new peak.

Neither the car companies nor dealers seem to be alarmed over the situation. New car inventories, many car factory officials assert, are relatively low compared with the rate of sales.

News of the AUTOMOTIVE



TEMCO TEMPO

Assemblies for 650-mph Air Force fighter bombers progress down a chain-drag conveyor line at a top speed of eight ft an hour at Temco Aircraft Corp. The company builds these F-84F Thunderstreak off fuselage sections for Republic Aviation Corp.

Chrysler Continues Push for Bigger Market Share

Chrysler Corporation continues its vigorous campaign to wrest at least 20 per cent of the automobile sales market this year. Backed by the general upsurge in the country's economy, and its own spectacular comeback in the first five months of this year, the corporation is looking ahead to making and sustaining further gains. However, it is not making any definite predictions for the third quarter.

For the first 4½ months, Chrysler's automobile sales were running about 40 per cent ahead of last year, bringing its market penetration up to 18½ per cent, only 1½ per cent short of its goal. Last year Chrysler held less than 13 per cent of the market.

Foreseeing greater opportunities for the automobile industry in the months to come, Chrysler continues to stimulate its dealers with a prospectus of the healthy economy. In individual meetings held in May throughout the country, Chrysler Division sales executives outlined to dealers the reasons for the tremendous surge in consumer demand which could result in a top year for the automobile industry.

Wages and salaries, the Chrysler executives observed, climbed to an alltime high rate of \$292 billion during the first three months of 1955,

about \$7.5 billion higher than 1954, with industrial production up 12 per cent over last year. Although consumer income spirals up, actual buying power is well ahead of that, it was noted.

The number of families with incomes exceeding \$5,000 has soared from 6 million in 1941 to 16 million last year, and economists now estimate that number will increase to 24 million by 1960. Further bolstering their optimism are predictions that the total number of cars on highways will increase at the rate of nearly 1.5 million per year and will reach 65 million in 1966 compared with 48 million at present.

It was further pointed out that by 1960 one of every seven families will own at least two cars, and that the trend toward suburban living will continue to increase car sales. Industry sources estimate that the car scrapage rate will increase from 3.5 million units a year to 4.5 million.

Chrysler Corporation at present is building cars at the rate of 30,000 units a week, more than double the rate at the same time last year. Chrysler Division during the first four months this year built more cars than it did during all of 1954, with dealers delivering 60,818 cars compared with 36,059 in the first four months last year.

Walker Becomes Director Of Styling at Ford

Appointment of Geo. W. Walker as vice-president and director of styling for Ford Motor Co. is another in a series of steps to give each department a chief executive. It marks the first time a stylist has been given vice-presidential status at Ford. Under the previous system, the body engineering and styling office came under the command of one executive.

Walker will direct styling activities as a member of the staff of L. D. Cruesoe, executive vice-president of the car and truck divisions, who recently assumed styling responsibilities previously held by the company's Engineering Staff. In addition, Walker will work with general managers of vehicle divisions in the development of forward product plans.

General management of all administrative functions of the styling staff will be headed by Victor Z. Brink, former assistant general manager of Ford's Aircraft Engine Division in Chicago. Walker for the past 10 years has been a styling consultant for Ford.

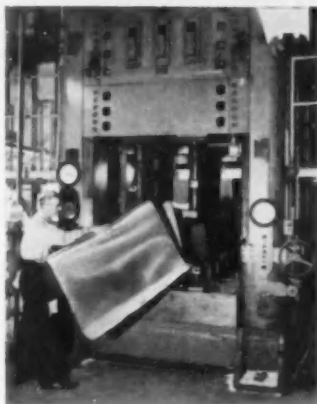
Record Six-Month Sales Expected by Fruehauf

Purchase of a plant in Drayton Plains, Mich., by Fruehauf Trailer Co. marks another step in the company's expansion program under which sales are expected to spurt to a record high for the first six months. Final figures on sales and earnings for the half year have not yet been released, but Roy Fruehauf, company president, indicated recently that sales would be over \$100 million.

Located on a 90-acre site, the 256,000 sq ft one-story Drayton Plains factory was built about a year ago for the Pontiac Motor Coach Co. Earlier, Fruehauf bought a plant in Delphos, Ohio, and announced that it would expand the Fort Wayne, Ind., facility. The company also plans to expand its large plant in Avon Lake, Ohio.

Sales of Fruehauf's new stainless steel Volume Van trailers are expanding, according to the company. Its latest orders call for more than 1400 civilian commercial trailers, valued at about \$8 million.

AND AVIATION INDUSTRIES



QUICK-ACTION PRESS

An HPM triple-action press forms Convair-Liner dorsal fin leading edge. Formed over a narrow plastic die (reinforced with a steel base plate), .032 gage, 2450 aluminum-alloy is formed in two press operations. Special steel jaws, grooved to prevent material slippage, are attached to the head of the press. About 70 per cent of the operation occurs in the first draw. Material is then heat-treated in a Knapp-Lee electric furnace at 930 F, and part is completed with second drawing operation.

Auto-Lite Expansion Includes Two Plants

The trend toward 12-volt electrical systems on vehicles has necessitated the expansion of two Electric Auto-Lite plants. They include a \$1 million addition to the Port Huron, Mich., wire and cable plant and a \$200,000 annex to the plant in Hazleton, Pa. Both expansion programs are scheduled for completion by late fall.

Ford Invites Educators To Confer on Industry

Educators will get a complete run-down on the operation of an automobile company when they meet at the first Ford Educational Forum, July 17-30 in Dearborn, Mich. Inspired by the growing interest among educators to acquire a better understanding of business and industry, the conference will include talks with company officials on organization and administration, marketing, production, public relations and economics of the industry.

TABLOID

Aeroquip Corp. has announced the purchase of a newly completed plant in Toronto, Ont., for its Canadian subsidiary. . . . Zack Co. has bought and opened plant facilities at 12600 Beech Road, Detroit, Mich.

* * *

Baldwin-Lima-Hamilton Corp. recently unveiled a new-type Diesel locomotive which it expects to build in the U. S. under license from Maybach-Mortorenbau Co. of Germany. B-L-H has also disclosed plans to increase its defense work and pursue a program of greater product diversification.

* * *

Northrop Aircraft, Inc., is building a new version of the twin-jet Scorpion F-89H all-weather interceptor for the Air Force.

* * *

Ford Motor Co. is reportedly studying plans for another multi-million dollar expansion of its Buffalo, N. Y., stamping plant.

* * *

Acushnet Process Co. is celebrating its 45th anniversary by opening expanded plant facilities. . . . Hooker Electrochemical Co. is celebrating its 50th anniversary this year.

* * *

Pangborn Corp. has installed a de-scaling machine in the demonstration room at its Hagerstown, Md., plant.

* * *

Hamilton Standard Div. of United Aircraft Corp. is now building 14 different models of pneumatic starters for gas turbine engines for six major aircraft engines and 16 types of aircraft.

* * *

Doddridge Screw Corp. has changed its name to DuAir Screw Corp. . . . Alpha Molykote Corp. is new designation of Alpha Corp.

National Automotive Fibres, Inc., has announced completion of a new \$500,000 plant at Forest, O. . . . American Machine & Foundry Co. will build a new \$1.25 million plant at Little Rock, Ark., for bicycle manufacture. . . . Sterling Aluminum Products, Inc., will erect a new factory and office building at St. Charles, Mo.

* * *

Ford Motor Co. of Canada is considering plans for the expansion of facilities at its Oakville, Ont., assembly plant and for the possible erection of a separate truck manufacturing plant there within the next few years.

* * *

Kaiser Aluminum & Chemical Corp. has won a contract to operate the \$15 million extrusion plant it is currently building for the Air Force at Halethorpe, Md.

* * *

Hercules Steel Products Corp. and Central Ohio Steel Products Co. are considering merger plans. . . . Consolidation of Durez Plastics and Chemicals, Inc., with Hooker Electrochemical Co. has been approved by stockholder vote.

* * *

Sparton Automotive Div. of Sparks-Withington Co. has bought from Karbelt Manufacturing Co. manufacturing rights to the latter's automotive safety belt.

* * *

Solar Aircraft Co. has begun manufacture of pod-mounted gas turbine power units for Convair C-131B flying electronic laboratories.

* * *

Industrial Filtration Co. and Olson Filtration Engineers, Inc., have signed an agreement authorizing the former to handle sales of Olson pressure-type filters in the metalworking and industrial fields.

News of the AUTOMOTIVE



FAST BLOW-UP

A five-second puff inflates the tubeless tires now standard on all Ford Motor Co. cars. It formerly took 75 seconds to inflate tire-and-tube combinations by the old valve-stem method. The new automatic inflation machine pictured above moves the tire-and-wheel assembly upward against an airtight bell and forces 25 lb of air between the tire bead and rim of the wheel in one big puff. The push-button-operated machines are in wide use.

Car Firms to Start Installing New Sealed Beams This Month

Approved by the American Assn. of Motor Vehicle Administrators more than 18 months ago, new improved sealed-beam headlamps, developed by the automotive and electrical industries will be factory-installed on automobiles after July 4. All but two states have legalized the new headlamps. In Georgia and Idaho, where legislation is not yet effective, vehicle dealers are being advised to aim the new lamps according to lower specifications of the original sealed beam unit.

Although Idaho has enacted legislation approving the new sealed beams, the law does not become effective until next January. In Georgia, the bill ran into a legislative snag and may not come up again until the 1956 session.



RARE ALFA ROMEO SPORTS CAR

Shown here is one of the few Alfa Romeo competition sports cars of this particular type ever built. The 250-hp two seater has a special coupe body by Boano of Turin, Italy.

Further Details Given On Ford Parts Plant

Ford's new chassis parts manufacturing plant north of Detroit, for which ground was broken last month (May), will contain 1.4 million sq ft of floor space devoted to production of differential and axle assemblies, ball joint suspension systems, drive shafts and related parts. A two-story administration building and utility and service buildings will complete the facility. It is expected that the plant will consume about three million lb of raw materials daily in production of components for all Ford branch assembly facilities throughout the country. About 30 railroad freight cars and 200 trucks will move out the finished products every day.

1955 RETAIL CAR SALES BY PRICE GROUPS*

Price Group	March				Three Months			
	1955		1954		1955		1954	
	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under \$2,000	341,690	54.01	275,910	57.82	821,447	53.21	696,072	58.69
\$2,001 to \$2,500	197,482	31.22	124,094	26.00	485,390	31.44	312,628	26.36
\$2,501 to \$3,500	75,679	11.67	57,118	11.93	186,565	12.21	124,471	10.40
Over \$3,500	16,367	2.90	20,906	4.37	48,503	3.14	52,938	4.46
Total	632,618	100.00	478,028	100.00	1,543,905	100.00	1,186,109	100.00

Dollar Volume of Sales

Price Group	March				Three Months			
	1955		1954		1955		1954	
	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under \$2,000	\$646,720,330	46.42	\$502,344,080	46.95	\$1,560,912,634	45.56	\$1,267,670,225	50.28
\$2,001 to \$2,500	460,423,163	32.84	285,097,109	27.56	1,131,911,926	33.02	713,185,974	28.28
\$2,501 to \$3,500	213,946,408	15.25	157,160,759	15.31	536,456,196	15.65	338,123,571	13.45
Over \$3,500	74,061,140	5.36	80,093,060	7.68	190,265,065	5.78	201,493,794	7.99
Total	\$1,397,591,041	100.00	\$1,026,295,024	100.00	\$3,427,545,821	100.00	\$2,521,473,164	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co. in conjunction with advertised delivered price at factory of four-door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

ASBE Technical Meeting Planned for Oct. 26-28

A drafting contest, introduced for the first time last year for high school mechanical drawing students, again will be featured at the 10th annual technical convention of the American Society of Body Engineers. The meeting, to be held Oct. 26-28 in Detroit, will include papers by authorities in automotive body design, in addition to the usual new product displays by automotive suppliers.

AND AVIATION INDUSTRIES

Turbochargers for Caterpillar Mark New Garrett Undertaking

Garrett Corp. has announced its entry into the industrial field with the formation of a new AirResearch Industrial Div. The step was disclosed in conjunction with a companion announcement that Garrett is currently producing new types of turbochargers for application to heavy-duty Diesel engines, following a multi-million dollar order from Caterpillar Tractor Co.

Along with the turbocharger, which is said to supply a major boost to the power output of Diesel engines, other products with an industrial potential are expected to be manufactured by the new division. Although the unit is currently located in Los Angeles, it will move shortly into expanded quarters at Inglewood, Calif.

'Brain' Will Keep Track Of Parts for U. S. Vehicles

The Ordnance Tank Automotive Command in Detroit shortly will place into operation the Army's first electronic brain which will keep track of the entire inventory of replacement parts for military vehicles. Developed by Radio Corp. of America, the \$5 million installation, called BIZMAC, will maintain an up-to-date record of every part required in combat and transport vehicles, and show when individual depots need replenishment. It is expected to play a big part in the government's cataloguing program designed to eliminate duplication of parts among the services.

ASME and IME of Britain To Hold Joint Conference

Great Britain's Institution of Mechanical Engineers will join hands with The American Society of Mechanical Engineers in sponsoring a joint conference on combustion. The conference will be held in the U. S. from June 15 to 17 on the campus of the Massachusetts Institute of Technology, Cambridge, Mass., and in England, Oct. 25 to 27, at the Great Hall of the Institution of Civil Engineers in London.

The conference will center around 40 papers to be presented under five

GRAND TOTAL FOR MONTH OF MARCH WAY AHEAD OF 1954 1955 New Passenger Car Registrations*

Arranged by Makes in Descending Order According to the 1955 Three Months' Totals

		THREE MONTHS							
MAKE		March 1955	February 1955	March 1954	Units		Per Cent of Total		
					1955	1954	1955	1954	
Ford		134,905	107,649	115,607	332,461	298,899	21.42	24.28	
Chevrolet		135,482	98,377	115,070	311,534	286,603	20.07	24.07	
Buick		89,236	51,634	47,972	171,464	104,943	11.06	8.81	
Plymouth		61,689	46,531	34,962	158,551	97,542	10.02	8.19	
Oldsmobile		51,463	40,379	35,037	131,711	89,622	8.88	8.85	
Pontiac		47,090	35,400	32,128	119,899	82,073	7.72	6.08	
Mercury		32,192	23,223	27,165	76,624	74,067	4.93	6.22	
Dodge		27,160	19,809	13,673	67,611	36,232	4.38	3.04	
Chrysler		15,928	11,398	10,179	40,671	27,683	2.62	2.32	
Cadillac		13,420	10,831	10,545	36,877	20,173	2.37	1.60	
De Soto		11,737	8,362	7,039	29,090	20,049	1.87	1.60	
Studebaker		10,412	7,300	5,319	24,386	23,248	1.57	1.95	
Nash		7,900	4,325	7,421	16,945	10,685	1.38	1.57	
Packard		5,521	3,100	4,954	10,309	12,766	.66	1.07	
Hudson		4,126	2,451	2,703	9,071	7,865	.50	.66	
Lincoln		2,584	1,995	3,825	6,757	8,944	.44	.70	
Willys		848	733	1,573	2,305	4,302	.15	.38	
Kaiser		169	170	814	539	1,762	.03	.15	
Misc. Domestic		32	28	301	134	761	.01	.06	
Foreign		3,748	2,563	1,846	8,646	4,872	.57	.41	
Total—All Makes		636,534	476,964	480,731	1,552,736	1,191,021	100.00	100.00	

* Based on data from R. L. Polk & Co.

sections: general, boilers, industrial furnaces, internal combustion engines, and gas turbines. Independent discussions of the same papers will be conducted at both Cambridge, Mass., and London.

The conference on June 15 to 17 at Cambridge, Mass., will tie in with ASME's Diamond Jubilee Semi-An-

nual Meeting to be held in Boston the following week. Persons interested in attending the Conference should write to: Mr. A. D. Blake, ASME, 29 West 39th St., New York 18, N. Y.

Continued on Page 96

QUARTERLY TOTAL DOWN FROM 1954 BY 11,000 UNITS 1955 New Truck Registrations*

Arranged by Makes in Descending Order According to the 1955 Three Months' Totals

MAKE	THREE MONTHS						
	Units			Per Cent of Total			
	March 1955	February 1955	March 1954	1955	1954	1955	1954
Ford	25,307	19,401	24,321	63,378	63,102	34.63	32.81
Chevrolet	19,024	16,496	24,640	50,872	66,877	27.81	34.36
International	8,723	6,857	7,133	23,966	19,212	13.10	9.90
Dodge	5,762	4,662	5,533	15,710	15,261	8.89	7.67
G. M. C.	3,670	3,056	6,303	12,876	17,067	6.93	8.79
Willys Truck	1,363	1,222	465	3,799	1,330	2.00	.69
White	1,031	919	1,132	2,971	2,939	1.62	1.51
Studebaker	1,091	772	682	2,613	2,536	1.43	1.31
Willys Jeep	792	657	540	2,009	1,779	1.14	.92
Mack	791	530	498	1,860	1,270	1.02	.86
Diamond T	309	236	277	796	679	.42	.35
Oliver	280	188	256	713	620	.39	.32
Reo	183	125	261	521	633	.29	.33
Brockway	89	86	103	272	300	.16	.16
Kenworth	82	56	49	229	137	.13	.07
Peterbilt	39	17	31	79	86	.04	.04
F. W. D.	22	16	42	87	108	.03	.06
Federal	6	3	37	12	103	.01	.05
Misc. Domestic	49	54	71	148	190	.08	.10
Foreign	99	71	14	216	47	.12	.02
Total—All Makes	64,732	56,242	72,503	162,958	194,126	100.00	100.00

* Based on data from R. L. Polk & Co.



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FEEL SHARP
BE SHARP**
as Gillette...
in selecting
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GILLETTE SAFETY RAZOR COMPANY, South Boston, Massachusetts, has been using *Texaco Clear-tex Oil B-1* as a dual purpose oil—cutting fluid and machine lubricant—for the past five years in its Brown & Sharpe and National Acme automatic screw machines.

This has resulted in long tool life,

fine finish and protection for the machines. *Texaco Cleartex Oil* has helped maintain a high level of production and a low level of unit costs.

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gladly help you select the right ones for your operation.

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Men in the News



United-Carr Fastener Corp.—Samuel A. Groves has been elected executive vice-president.

Baldwin-Lima-Hamilton Corp.—**McClure Kelley** has been elected president, succeeding **Marvin W. Smith**, who remains chairman of the executive committee.

Holley Carburetor Co.—**Danforth Holley** has been made vice-president of public relations and new products.

Kearney & Trecker Corp.—**Ralph W. Burk** has been elected executive vice-president, and **Raymond L. Bischoff** has been named financial vice-president.

Studebaker-Packard Corp., Styling Div.—William M. Schmidt has been appointed vice-president and director of styling.



Lincoln Div., Ford Motor Co.—**W. D. Singleton** has been appointed general manufacturing manager; **H. B. Daniels**, general sales manager; **D. R. Learned**, controller; **L. E. Krieg**, assistant to the general manager; **Will Scott**, merchandising and product planning manager; and **J. H. Barnes, Jr.**, assistant general sales manager, planning and analysis.

Chrysler Div., Chrysler Corp.—**E. E. Angerman** is now management development coordinator, and **Paul E. Anders** has been made director of operations analysis.



Tinnerman Products, Inc.—Robert C. Overstreet was elected president.



Ohio Crankshaft Co.—C. H. Kimmel has been elected president, and M. J. Hoke has been advanced to vice-president and general manager of the Crankshaft and Camshaft Div.

White Motor Co.—**Robert F. Black** has been elected chairman of the board and reelected president and chief executive officer. **J. N. Bauman**, **V. W. Fries**, and **E. S. Reddig** were named executive vice-presidents.

Westinghouse Electric Corp.—**Chris H. Bartlett** and **Charles C. Shutt** have been elected vice-presidents.

Chrysler Corp.—William A. Martin has been elected president of the Marine and Industrial Engine Div. of the corporation.



U. S. Steel Corp.—**Roger M. Blough** has succeeded **Benjamin F. Fairless** as chairman of the board and chief executive officer. **Clifford F. Hood** has been designated chief administrative officer, and **John S. Tennant** has been elected general counsel.

Plymouth Div., Chrysler Corp.—**Frank Fraser, Jr.**, has been appointed director of forward planning.



Holley Carburetor Co.—Edwin R. Stroh has been appointed vice-president and automotive sales manager, while John C. Holley has been named vice-president and director of sales.



Eaton Manufacturing Co.—Richard H. Gale has been appointed director of advertising.

Necrology

Morgan D. Douglas, 63, retired general manager of GMC Truck & Coach Div. of General Motors Corp., died May 3, at Detroit, Mich.

Charles F. Whitman, 82, a founder of Automatic Products Co. and former Buick executive, died May 1, at Detroit, Mich.

F. J. Peters, vice-president in charge of engineering for National Automatic Tool Co., died recently, at Richmond, Ind.

Louis Breguet, 74, pioneer French aviator and aircraft manufacturer, died May 4, at St. Germain en Laye, France.

Harry R. Badger, 57, vice-president in charge of scheduling for Fruehauf Trailer Co., died May 7, at Detroit, Mich.

C. R. Benton, 80, retired head of Benton Manufacturing Co., died May 10, at Vergennes, Vt.

E. D. Frank, vice-president of National Automatic Tool Co., died May 5, at Chicago, Ill.

Leigh R. Evans, 71, senior vice-president of Hardinge Bros., died May 1, at Elmira, N. Y.

L. E. Emerich, 56, director of marketing for Leeds & Northrup Co., died May 5, at Plymouth Meeting, Pa.

Quincy Bent, 75, retired vice-president of Bethlehem Steel Co., died May 5, at Wyhill Farms, Pa.

A. F. Greiner, 73, consulting engineer and former Univ. of Mich. professor, died recently, at St. Petersburg, Fla.



Another B&W Mechanical Tubing Application

BIG BROTHER TO A DENTAL DRILL

"Painless," efficient drilling of primary blast holes in the earth's rock crust—by either percussion or rotary action—is a cinch for Ingersoll-Rand's heavy-duty Quarrymaster. But its greatest advantage lies in the built-in hole cleaner, made possible by using B&W Mechanical Tubing for the drill rod. An automatic, continuous stream of compressed air is forced down through the tubular drill rod to the bit and back up, between drill rod and casing, to the surface, carrying the cuttings with it. And

this hollow drill rod has been proved stronger, lighter and more rigid than a solid bar.

To satisfy vital requirements such as long life under extreme conditions of impact, B&W imparted desirable cold-worked properties to this tubing and also devised a special hot-upsetting procedure. With Quarrymasters now in service all over the world, the effectiveness of their drill rods made of B&W Mechanical Tubing has long since been decisively demonstrated.

For a comprehensive story of how B&W Mechanical Tubing serves many industries, ask for Technical Bulletin 361 A1



**THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION**

Beaver Falls, Pa. and Milwaukee, Wis.:
Seamless Tubing, Welded Stainless Steel Tubing
Alliance, Ohio: Welded Carbon Steel Tubing
Milwaukee, Wis.: Seamless Welding Fittings

TA-5005(M)



GEARS *that keep* **AMERICA** *on the* **GO!**

Gears turn horsepower into motion—whether for work or for pleasure. In vehicles of almost every description—from boats to heavy farm machinery—you'll find flywheel ring gears, transmission gears, differential drive gears, and other gears that are designed, engineered, and manufactured by Automotive Gear Works rendering the best possible

service in the transmission of power.

If you have a product that serves up-and-going America it may be worth your while to learn how our staff and facilities can best be utilized to supply all your gear needs—and how we serve as the "gear department" for many leading manufacturers. Why not write today for further information?



FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

Automotive Gear Works, inc.

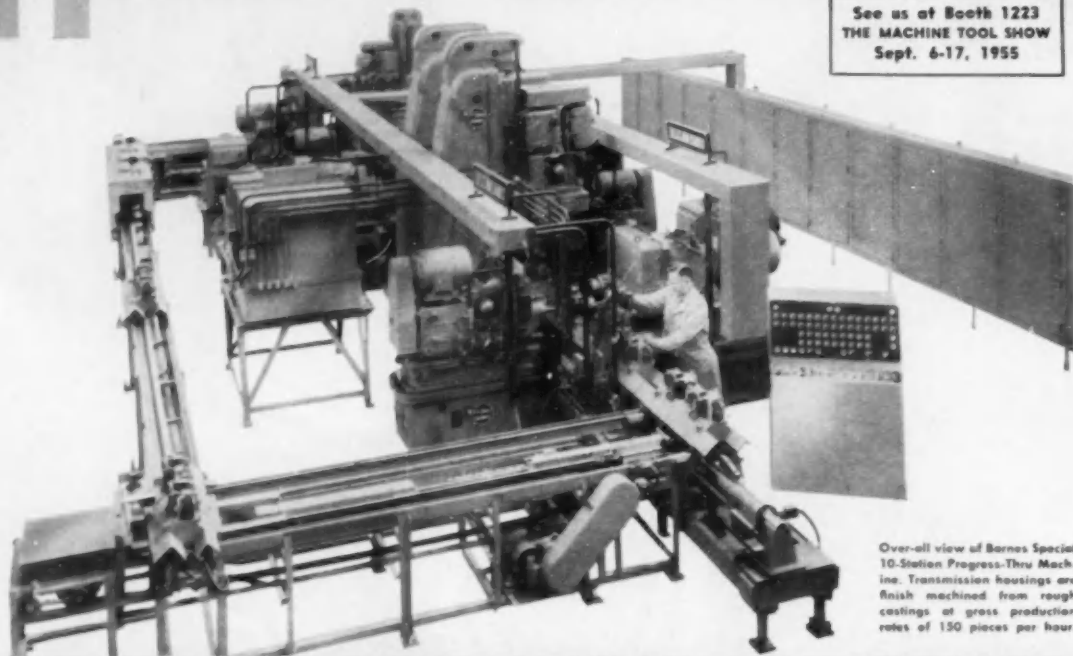
ESTABLISHED IN 1914

RICHMOND, INDIANA

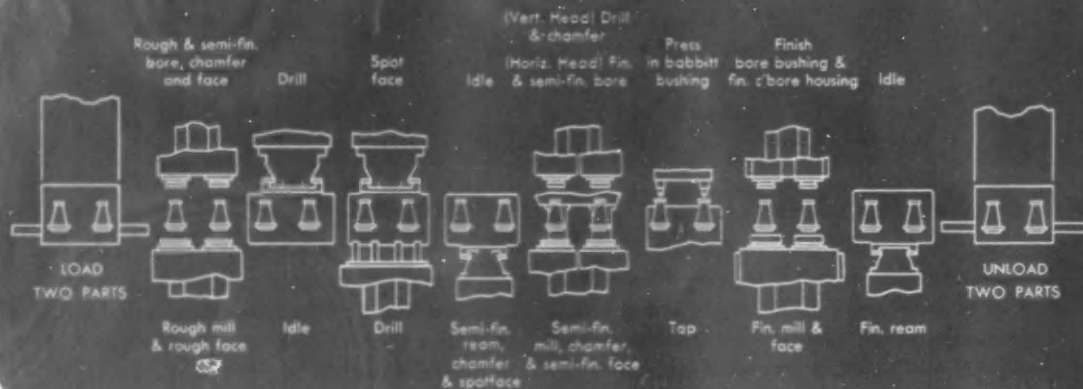
TRANSMISSION EXTENSION

HOUSINGS NOW MACHINED COMPLETE

See us at Booth 1223
THE MACHINE TOOL SHOW
Sept. 6-17, 1955



Over-all view of Barnes Special 10-Station Progress-Thru Machine. Transmission housings are finish machined from rough castings at gross production rates of 150 pieces per hour.



*Builders of
Better Machines
Since 1872*

▲ Schematic drawing of machining operations. Total concentricity on all operations does not exceed .002". Housings are held in transfer plates which are located by two hydraulically actuated dowels and clamped hydraulically at each machining station.



Special
Machine Tools



Special
Conveyor Units



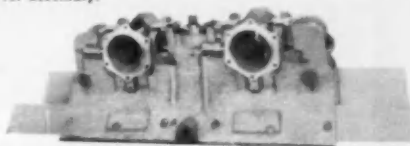
Special
Process Equipment

MULTIPLE SPINDLE DRILLING • BORING • TAPPING MACHINES

FROM ROUGH CASTING TO FINISHED PART



Transmission extension housings are finish machined in automatic cycle from rough casting to finished workpiece. After rapid washing and final inspection, the part is ready for assembly.

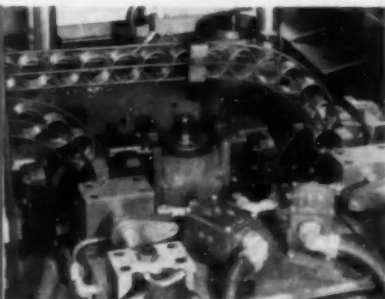


View of workpieces in special transfer plate fixture. Both housings are located and accurately positioned by means of dowels and screw-operated V-block clamps.

ON W. F. & JOHN BARNES SPECIAL 10-STATION PROGRESS-THRU MACHINE

Here is another typical example of how W. F. & John Barnes Six-Point Machine Tool Building Service has helped increase production efficiency for a leading automobile manufacturer. All machining operations on transmission extension housings are now combined in one Special Barnes 10-Station Progress-Thru Machine at a production rate of 150 pieces per hour. Two operators, one at the loading end and the second at the unloading end, load and unload housings on transfer plates which carry workpieces through the entire machining cycle. Operations include boring, facing, milling, drilling, reaming, automatic press-in of babbitt bushings, and combination finish bore babbitt bushing and finish counterbore housing.

Whether your production requires large or small machines, you'll find the coordinated services at Barnes can help you solve problems quickly and efficiently.



Closeup of station seven where babbitt bushings are automatically pressed-in to the small end of the housings. Bushings are hopper loaded by operator at the unloading station.

BARNES' COORDINATED 6-POINT MACHINE TOOL BUILDING SERVICE INCLUDES:

- 1 **SPECIALIZED MANUFACTURING FACILITIES** — 75-year background, large well equipped plant efficiently suited to build high production machines.
- 2 **SPECIAL HYDRAULIC EQUIPMENT** — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.
- 3 **SPECIAL ELECTRICAL EQUIPMENT and CONTROLS** — individually designed and built for maximum safety and ease of control, with circuits that assure the most dependable coordination of all machine functions.
- 4 **SPECIAL GAUGES, FIXTURES, TOOLS** — designed for each individual machining problem, assure accuracy of operations at high production speeds.
- 5 **SPECIAL HANDLING AND CONVEYOR EQUIPMENT** — designed and built to reduce work handling, effect maximum safety and efficiency.
- 6 **COORDINATED DESIGN AND ENGINEERING** — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Team-work solves complex problems quickly.

WRITE FOR
FREE BOOKLET

Ask for free booklet "Coordinated Machine Engineering" describing the scope of Barnes machine tool building service.



W. F. & JOHN BARNES COMPANY MACHINE TOOL DIVISION

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Special
Electrical Controls

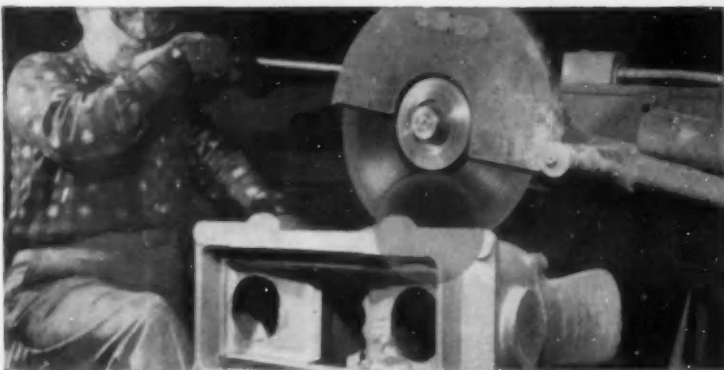


Feed
Machinery

AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



BF A Universal favorite for removing light welds, breaking edges on machined work, deburring, taking off flash from plastic parts and many other light portable and bench grinding operations. To be used on periphery only.



BN The preferred cut-off wheel for non-ferrous and non-metallic jobs. Also excellent for cutting wire rope, slotting rails, tuck pointing, etc. Used on swing-frame and stationary type cutting-off machines, large and small portables.



BF MOUNTED WHEELS AND POINTS have the same strong laminated construction as the larger BF wheels. For polishing die cavities, chamfering, Brinell spotting, etc. For hand finishing, use BF sticks.



BD A specialist in heavier stock removal, such as welds on fabricated work, smoothing flame-cut edges, cleaning between teeth of gear castings, etc. — also for slotting, notching and cutting-off.



BFR Excels at the lighter portable jobs, such as rust and scale removal, light weld grinding, scarfing and beveling, blending contours, notching gates and risers.

The jobs they do!...The money they save!

Norton Reinforced Wheels add the "TOUCH of GOLD" to countless everyday grinding jobs

With Norton Reinforced Wheels you get extra-long service life, exceptional strength and fast, cool, trouble-free grinding — the Norton-engineered "Touch of Gold" that saves you money in the widest range of routine grinding jobs, from light deburring to heavy cutting-off.

To this top grinding performance Norton Reinforced Wheels add a wide margin of safety. All four are resinoid bonded and reinforced by layers of tough fabric molded into them. As follows:

BF — Semi-flexible straight wheel, cotton fabric reinforcement. Also available in mounted wheels, points and hand sticks.

BN — Straight wheel with glass cloth reinforcement. Primarily a cut-off wheel, its

rough, knurled sides provide additional cutting action.

BD — Rigid hub-type. Glass cloth and Nylon reinforcement. Designed especially for right angle portables and disc sanders.

BFR — Semi-flexible hub-type. Cotton fabric and Nylon reinforcement.

SEE YOUR NORTON DISTRIBUTOR for a demonstration of Norton Rein-

forced Wheels in your shop. Ask him for the big new catalog on Reinforced Wheels. Or write to **NORTON COMPANY**, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

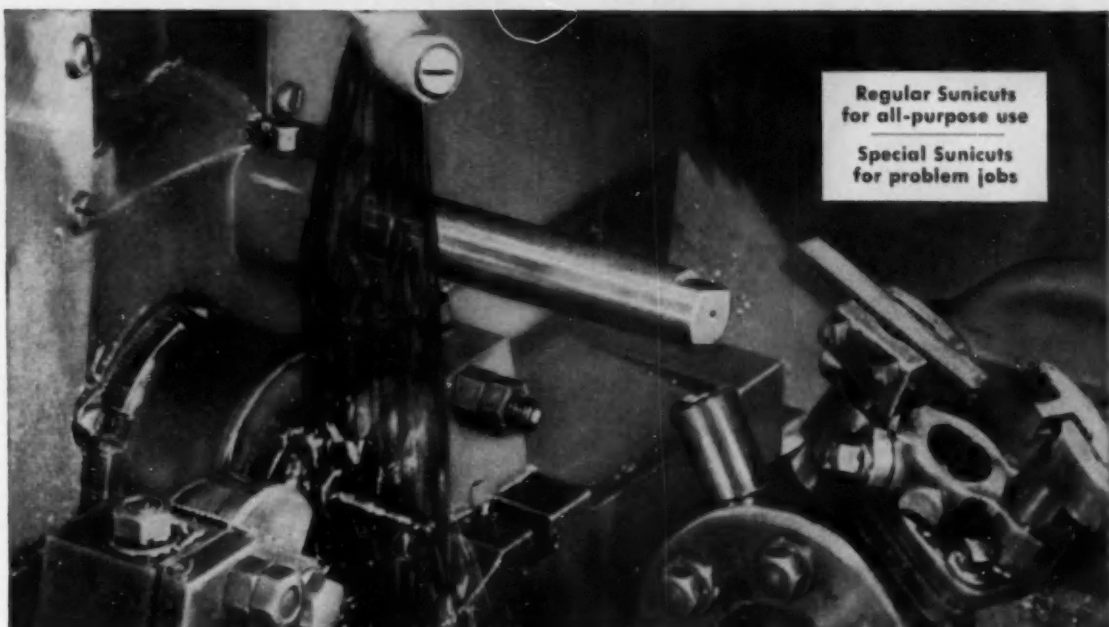
Making better products...to make your products better

W-1638



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NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



to assure peak production...

THERE'S A SUNICUT OIL FOR EVERY SCREW MACHINE OPERATION

Today's Sunicut cutting oils are the result of years of research and on-the-job testing. And they're versatile, too. In many plants *all* screw machine jobs are being handled by a single Sunicut grade.

For the problem jobs, Sun makes a wide variety of special Sunicut oils, each designed to do the job better.

Your Sun representative has the practical know-how to analyze *your* problems. Working with Sun's experienced engineering staff, he's ready to help you pick the Sunicut oil that will give you the tolerances and finishes you want.

The Sunicut series for screw machines is only part of a large selection of non-emulsifying and emulsifying cutting oils available to help you get peak production at the lowest possible cost.

For complete information about Sun cutting oils see your Sun representative... or write Sun Oil Company, Philadelphia 3, Pa., Dept. AA-6.



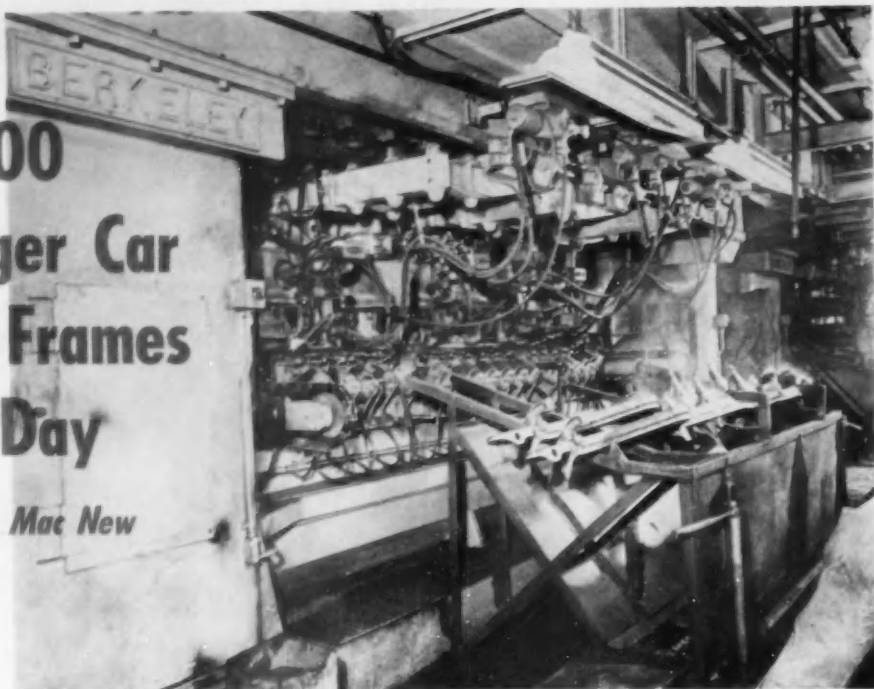
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

3000 Passenger Car Chassis Frames Per Day

By Thomas Mac New



This Berkeley automatic welder joins the frame side member and sub side member by welding along the entire length of the units.

WHAT is considered to be one of the most modern and unique passenger car frame assembly lines has been installed at the Budd Co. Red Lion Plant in Philadelphia for Chevrolet frame production. This well-planned line turns out a large percentage of Chevrolet's total frame output.

To meet the required increase in production of Chevrolet cars, as evidenced by the new car demand of all makes so far this year, Budd purchased what it believes to be the most modern equipment, not only to get the production figures up, but in consideration of the workers' safety and freedom from fatigue.

The company bought new welding presses, automatic riveting machines, manual welding and riveting equipment, and material handling devices; and also devised certain automatic units not available on the open market. All of the new machinery was installed in an efficient straight-line layout with parts feeding either straight in or perpendicular to the major assembly flow. Most of the conveyors were built by Jervis B. Webb Co., Overhead Conveyor Co., and Kremser & Co.

Before the start of assembly, all rails coming in from the Budd press shop are sent through an Industrial Washing Machine Corp. washer. Individual parts are transported to sub-assembly parts stations adjacent to the main assembly line.

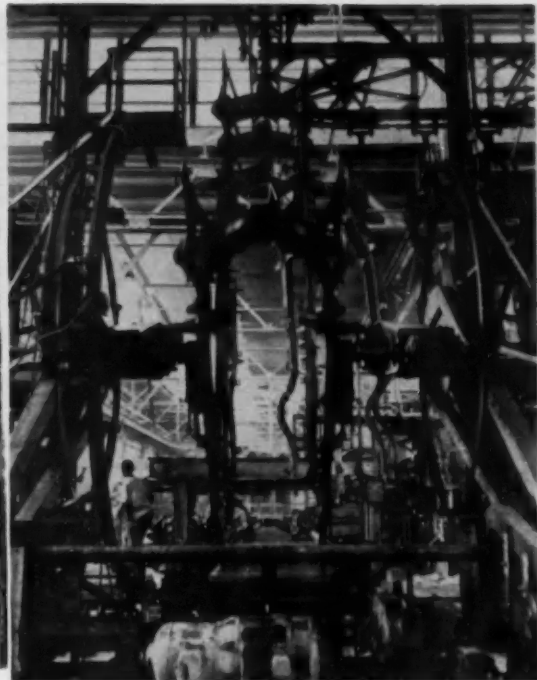
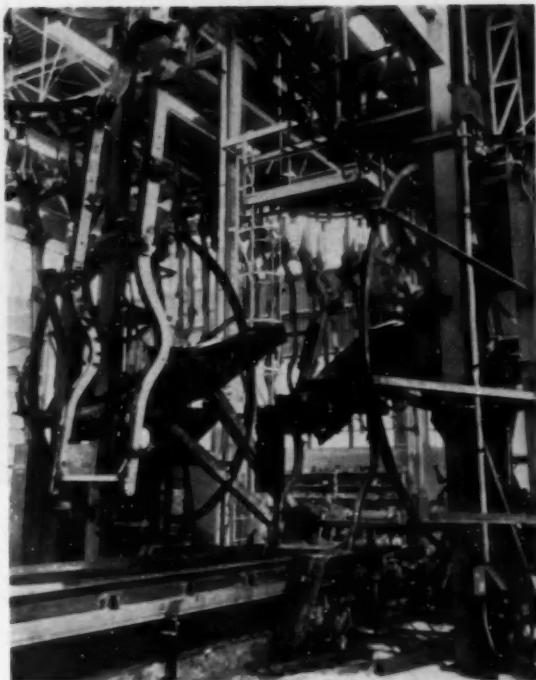
Two well-automated assembly lines are devoted to the sidemember sub-assembly and the front crossmember sub-assembly. The sidemember line is divided into two sections, left-hand and right-hand members,

which run parallel to each other. Parts going through the line are fed straight in to the main line. Front crossmembers are brought in at right angles to the final line.

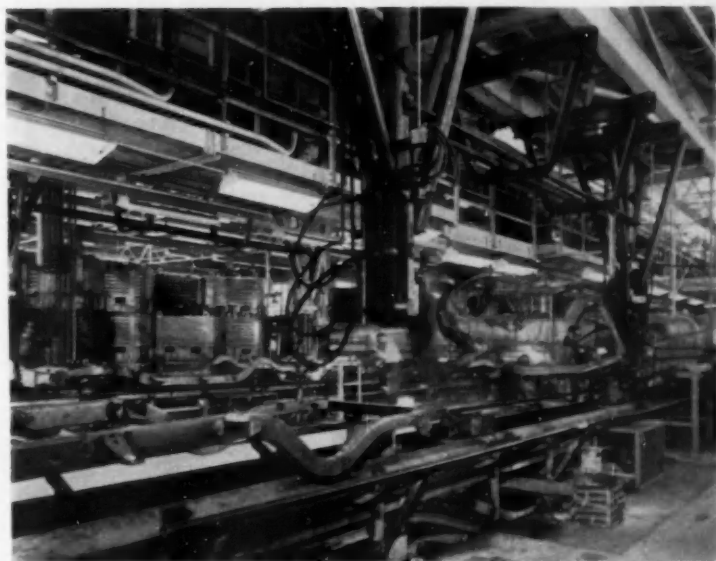
First operation on the sidemember line is done in National welding machines where brackets and spacers are resistance welded in place. Various other parts are added and secured by manual welding and riveting to the sidemember during the next several operations. Then the sub-assembly is transferred to a Berkeley automatic arc welding machine that welds the seam along the length of the two channel-shaped pieces—the sidemember and sub sidemember—that make up the box type frame sidemember. The Berkeley unit uses Linde welding guns, composite and welding rods for the operation. After defluxing and supplementary manual arc weld, the sidemember sub-assembly is conveyed to a Danly fixture for hydraulic piercing operations. Conveyors then carry the sidemember sub-assembly to the main or final line for processing.

While the right and left side assemblies are being made up, the front crossmember sub-assembly is manufactured on a straight-through line adjacent to the final line. This line, however, flows in an opposite direction to the movement of the sidemember and main assembly line. Therefore, when the crossmembers are completed, they are delivered to the main line at the same location as the sidemembers.

The first step in the construction of the front crossmember is a piercing operation in a clearing press. A slide type conveyor then moves the crossmember to



When assembled frames come to the end of the table-height assembly conveyor, they are picked off and swung upward by this Ferris wheel developed by Jervis B. Webb Co. Frames are automatically hooked on the overhead conveyor leading to the wash and paint room.



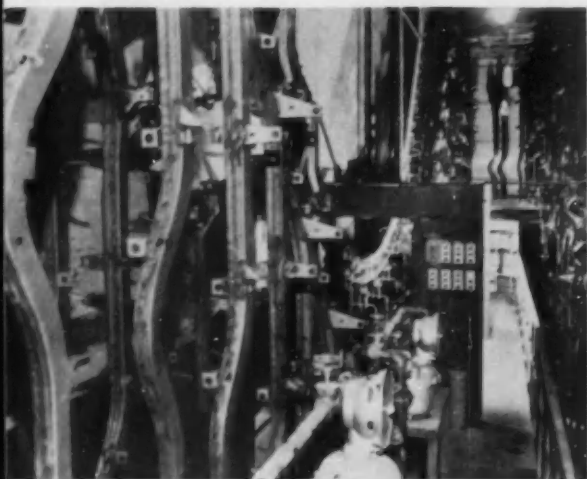
The frame is turned over 180 deg automatically by this hydraulically operated device designed by Budd engineers.

a second piercing operation. The main press structure used for this piercing phase was designed and built by Budd and equipped with Hannifin hydraulic piercing units. Following the second piercing, the front crossmember is transferred to a special United weld-

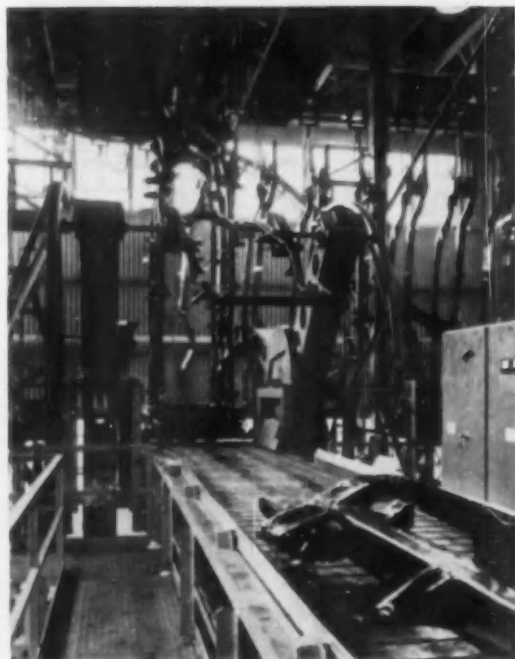
ing machine where the cover plate is joined to the crossmember. Subsequently, after a series of parts are arc welded to the work in process, the sub-assembly is placed in a large Verson Allsteel press. During this phase of manufacture, the front crossmember sub-assembly is thoroughly straightened—as there is usually some warpage of the part due to the welding operations. Further piercing is then performed on a Budd type fixture similar to the one previously described. The workpiece is then automatically transferred to a National Automatic Tool Co. drilling machine. In this machine, several holes in the crossmember sub-assembly are drilled and reamed so that exact alignment can be obtained during final assembly operations on the complete frame. A few other small parts are welded to the

work, and it is then given a final inspection before being placed on the conveyor to the frame assembly line.

Initial operations on the two final assembly lines are performed manually with workers staking the



Dispatch Oven Co. built the huge wash and paint room for the Chevrolet frame installation. The Palmer-Bee overhead conveyor carries the frames through a wash cycle and then dips them and transports them through the paint trough. It then circles back to carry the frames over the drip rack and then to the hot air drying chamber.



As the frames come from the paint room to the shipping room, they are picked off the overhead conveyor and placed on a slot-type conveyor by this clever Webb materials handling unit.

various components—front crossmember, side frames, rear crossmember, and front crossmember to sidemember brace—that make up the major portion of the frame. Hand hammers are utilized to drive 20 rivets at the specified locations. A total of 40 rivets, 5/16 in. by 7/8 in., are used for each frame. The assembly is then lifted from its jig and conveyed to

a riveting station where the one rivet on each side that secures the front crossmember to the sidemember brace and upper flange of the sidemember is headed.

At the third station along the line, the frame assembly is set up in a Danly automatic riveting machine. This hydraulically operated unit heads a total of 26 rivets at one time. Three rivets on each side at the rear crossmember and side frame joint, two rivets on each side at the side member and front crossmember brace joint, four rivets on each side at the front crossmember and side member lower flange joint, three rivets on each side at the front crossmember and sidemember upper flange joint, and one rivet on each side at the front crossmember and sub sidemember upper flange joint are secured during the operation.

The next several operations are performed manually while the frame is conveyed over the assembly line. A long line of workers grind welds, arc weld parts, and inspect the workpiece.

One of the clever automatic devices—a turnover—along the line was conceived by Budd. This hydraulically-operated mechanism automatically picks the frame off the line, turns it over, and places it back on the conveyor. It is actuated and controlled by a series of limit switches and can be operated manually if desired. The bottom of the frame then receives a series of welding operations and the joining of miscellaneous parts.

Before the final inspection of the frame, the unit is reshaped in a special fixture equipped with hydraulic cylinders. After the reshape and inspection procedures, the frame is automatically picked off a slot type conveyor by a unique two-arm Ferris wheel arrangement designed by Webb. This wheel picks up a frame from the assembly conveyor and hangs it on a Palmer-Bee overhead conveyor leading to the Dis-

patch Oven Co. wash and paint oven.

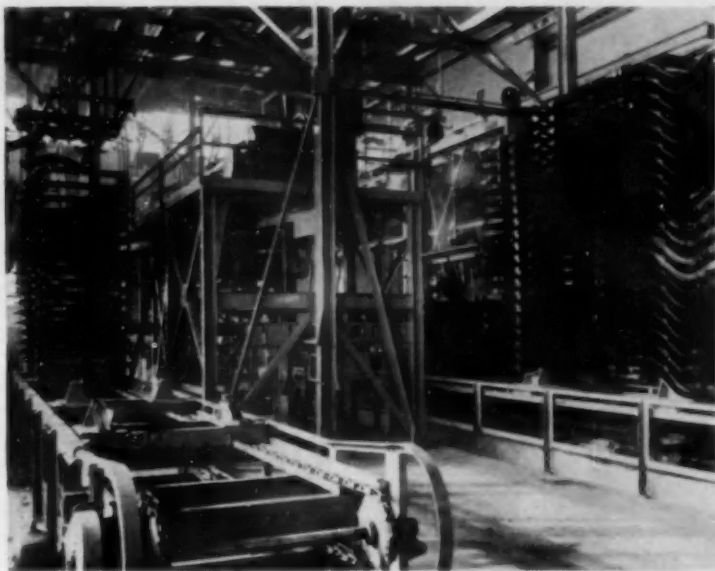
In the specially built room housing wash and paint facilities, the frames are thoroughly washed, and then run through a huge tank containing a special black paint. From the paint dip, the frames run over a drip rack, and are then hot-air dried. The conveyor system carries finished frames to the shipping point which is equipped with one of the most ingenious materials handling devices ever devised.

The shipping room device—built by Jervis B. Webb—has three trunnion mounted arms which pick a frame off the overhead conveyor and deposit it on a continuous slat type conveyor. An operator is stationed at the head of the conveyor and by remote control shuttles frames off to either the left or right by means of two special overhead hoists. These hoists then suspend the frame over a table-height conveyor. An operator in a small elevator positions the hoist so that the frame is deposited over a special fixture on the conveyor. The man in the elevator is always in a position to make sure that the frames are stacked properly. One frame is stacked on the other until there is a total of 20 frames.

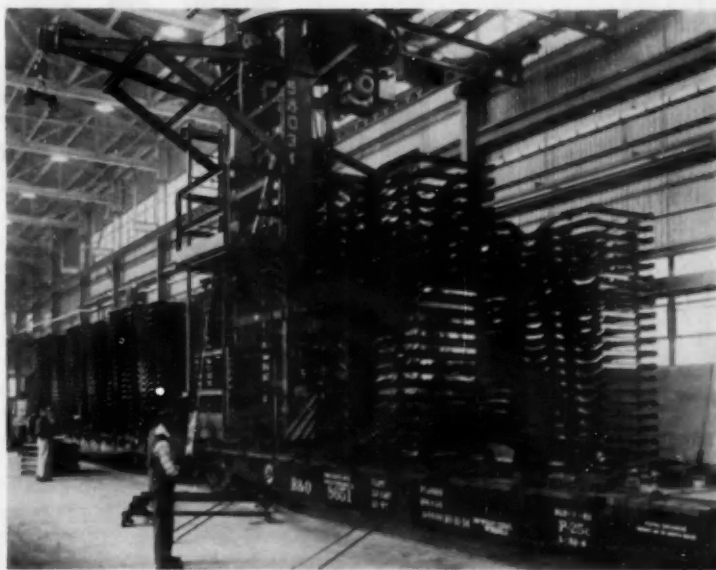
When the stack of 20 frames is obtained, the table-height conveyor is moved up one station. From the forwardmost station, another workman picks up the stack by means of a Whiting Stak-Rak crane. The frames are then deposited on waiting specially equipped railroad flat cars. With the new form of shipping utilized by the Budd Co., each flat car can handle 120 passenger car frames. Approximately 25 flat cars leave the Budd Chevrolet frame platform every work day.

New Head for U.S. Operations At Massey-Harris-Ferguson

H. H. Bloom will supervise overall North American operations of Massey-Harris-Ferguson, Inc., as a re-



Frames are carried by overhead hoist from the slat conveyor to either a left or right table-height conveyor on the shipping room floor. Elevator operators stack the frames 20 high.



A Whiting Stak-Rak is used to load flat cars from the 20-high stacks of frames on the shipping room conveyors. Each flat car holds 120 frames.

sult of changes in top level management of the company. He formerly was president of the company in Racine and vice-president of the parent company in Toronto. C. P. Milne, former executive vice-president, will head the U. S. company, while G. H.

Thomas, administration vice-president, becomes vice-president and general manager of the Toronto operations. Lee J. Wolf, former assistant treasurer, was appointed administration vice-president, and M. E. Fellwock was named assistant treasurer.

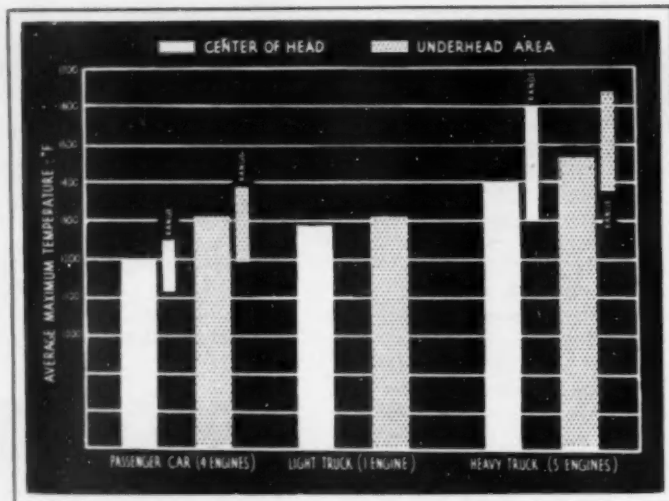
Exhaust Valve CORROSION in Gasoline Engines



Typical valve face corrosion

THE fact that exhaust valves in gasoline engines should corrode is not difficult to understand when one examines the chemical environment in which they operate. The combustion of a typical motor gasoline will yield appreciable quantities of free oxygen, lead, bromine, chlorine and sulfur in the exhaust gases, plus lesser amounts of many other materials. It should also be remembered that these exhaust gases come in contact with the valves while they are very hot and it is not inconceivable that the surface temperatures on some parts of the valve can exceed 2000 F. We have no way of determining exactly the surface temperatures but are quite familiar with the average mean temperatures of the internal valve structure (Fig. 1). In passenger car engines the temperature at the valve head where it is exposed to the gases in the combustion chamber averages about 1200 F, whereas on the underhead area where the valve is in the path of the exhaust gas stream the temperatures reach 1300 F. The situation is more severe in the heavy duty engines and temperatures here may well exceed 1600 F. There is considerable variation in valve temperatures between engines of different designs and this may help to explain why valve corrosion is more of a problem in some engines than in others.

Typically valves burn or fail through corrosion of the seating face where they close against the valve seat. Corrosion here is particularly serious inasmuch as such corrosion interferes with the seal and thus allows combustion gases to leak past the valve face.



Valve temperature vs engine installation

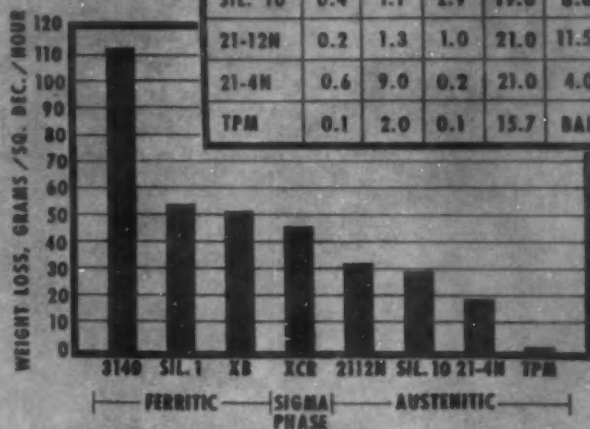
FIG. 1

This leakage raises the valve head temperature markedly, in some instances as much as 300-400 F, and thus accelerates the corrosion that is already occurring. Ultimately, the reaction becomes so rapid that the valve is unable to effectively close off the combustion chamber and the engine will no longer operate satisfactorily.

Other types of corrosion can also occur on exhaust valves. Corrosion of the top of the valve head is frequently encountered but this corrosion is not as serious as the face corrosion inasmuch as it does not interfere with the functioning of the valve. Of course, if sufficient material corrodes away, the valve will lose its structural strength and thus fail. Corrosion can also occur on the stem portion of the valve. Corrosion of this sort, if unchecked, can lead to failure of the valve through breakage at the corroded area and subsequently cause a great deal of damage to the engine. Fortunately, failures of this type are not frequent but the fact that they do occasionally occur must be recognized. Another form of corrosion occurs on faced exhaust valves. In this type of valve construction, a highly corrosion-resistant material is welded to the valve base material at the seat face in order to avoid

	C	Mn	Si	Cr	Ni	Fe	Mg	OTHER
3140	0.4	0.8	0.3	0.7	1.3	BAL		
XB	0.8	0.4	2.0	21.0	1.5	BAL		
SIL. 1	0.5	0.4	3.3	8.5		BAL		
XCR	0.4	1.0	1.0	23.5	5.0	BAL		2.8Mo
SIL. 10	0.4	1.1	2.9	19.0	8.0	BAL		
21-12N	0.2	1.3	1.0	21.0	11.5	BAL	.18	
21-4N	0.6	9.0	0.2	21.0	4.0	BAL	.40	
TPM	0.1	2.0	0.1	15.7	BAL	6.0		3 Ti

TABLE I
Analysis of valve
steel alloys



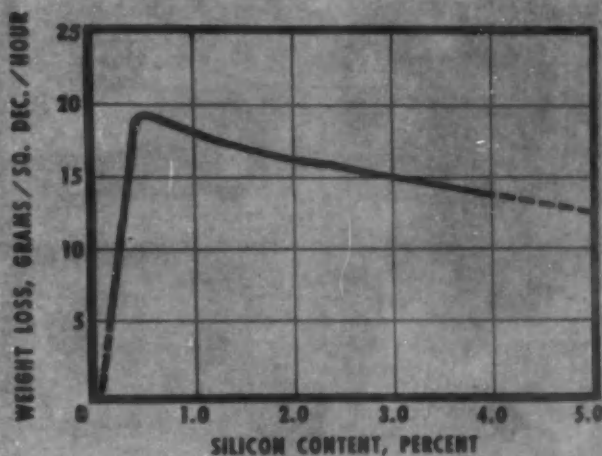
Corrosion resistance of conventional valve alloys

FIG. 2

some of the face corrosion described previously. Sometimes accelerated corrosion will occur at the juncture between the two materials. Such corrosion preferentially attacks the valve base material and weakens the support behind the welded layer. Ultimately such corrosion will cause distortion and cracking of the valve face.

It is particularly difficult to determine just what elements in the exhaust stream cause valve corrosion to occur. We know from experience that tetraethyl lead plays a part but not all corrosion can be attributed to lead. Other elements such as the sulfur may have a marked influence on corrosion. Then, too, any free oxygen in the exhaust gas stream will accelerate oxidation of the valve steels. Deposit forming elements in the fuel or lubricating oil can also influence corrosion by forming deposit layers between the valve and the seat. These deposits may lead to solid-state reactions which induce valve face corrosion. Again, local ruptures in the deposit layers permit combustion gas leakage to occur. Such leakage raises the valve temperature and has an important effect in accelerating valve corrosion.

It is necessary in developing suitable alloys for use in exhaust valves to have some sort of a laboratory



Corrosion resistance of 21 per cent chromium, 15 per cent nickel steel

FIG. 3

bench test that can be used for screening purposes. Thompson's laboratories have devised a test procedure which measures the resistance of the material to corrosion in molten lead oxide. A sample of the material is placed in a crucible with lead oxide and heated to 1675 F for one hour. (Cont. on next page)

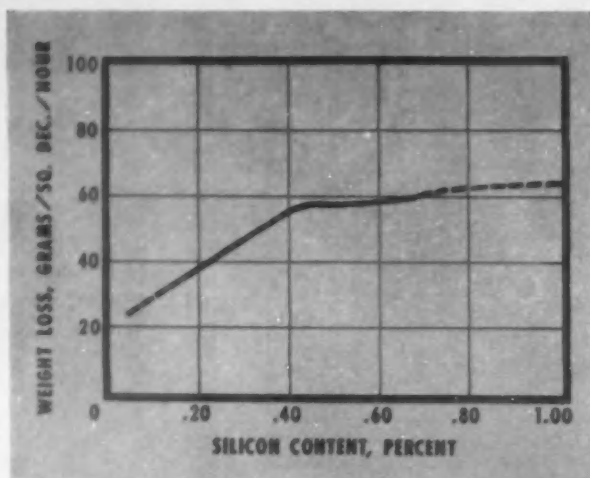


FIG 4—Corrosion resistance of 21 per cent chromium, 15 per cent manganese steel

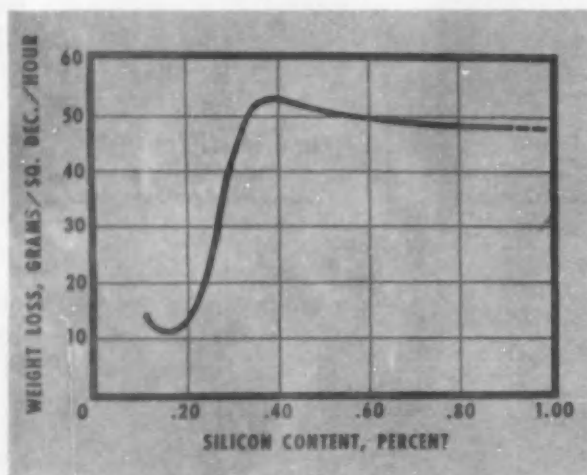


FIG 5—Corrosion resistance of 21 per cent chromium, three per cent nickel, 10 per cent manganese steel

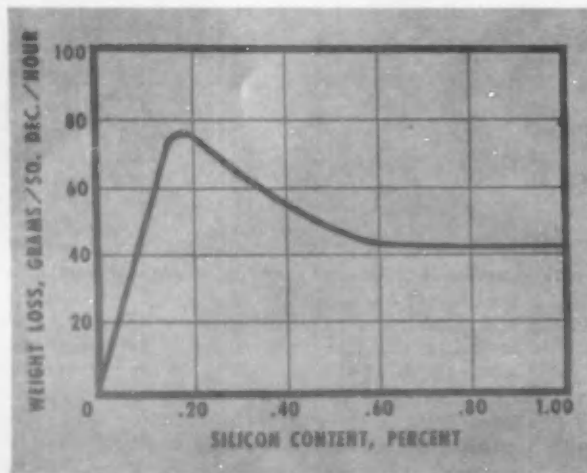


FIG 6—Corrosion resistance of 21 per cent chromium, four per cent nickel, three per cent molybdenum steel

The weight loss of the specimen is then determined and this loss used as a means of expressing the relative corrosion resistance of the alloy. This test does not consider the effects of bromine and chlorine present in the exhaust gases, nor does it concern any of the other elements ordinarily found in gasoline. Nevertheless, experience has shown that it correlates fairly well with tests conducted in engines and therefore has a certain amount of usefulness in developing new valve alloys. Of course, it should be pointed out that the final proof can only be obtained from actual engine tests since so many variables are encountered relating to the engine design, the fuel, the lubricant and others.

All of the valve alloys in current use have been subjected to this lead corrosion test (Fig. 2). The SAE-3140 steel is frequently used for intake valves in current engines and illustrates how a conventional low alloy steel reacts in this test. The Silcome No. 1 and Silchrome XB are alloys that were developed several years ago. These materials contain appreciable percentages of chromium and silicon which were used to impart oxidation resistance to the steel. These materials enjoyed wide usage in engines prior to large scale use of tetraethyl lead and still find application in equipment where the design is such that the valve operates at moderate temperatures. Silchrome XCR is a phase hardening steel that was developed in order to obtain optimum physical properties in the valve structure. This steel contains a nickel addition which contributes to its improved corrosion resistance. The 21-12N, Silchrome 10N and 21-4N are austenitic steels, to obtain high hot strength. Additional alloying elements, nickel and manganese, are used in these materials to obtain the austenitic structure and these, in turn, contribute to the corrosion resistance. The TPM material is a nickel base alloy used for aircraft valves, in which nickel and chromium account for the bulk of the analysis.

It should be pointed out that with some notable exceptions, none of these alloys was designed primarily for corrosion resistance. Because the valve is a highly stressed operating member in the engine, it is necessary that the material used possess unique physical properties at elevated temperature. Consequently, a good deal of attention has been devoted to obtaining creep resistance, high hot fatigue strength and high hot hardness and the corrosion resistance of these alloys represent something of a compromise. The exceptions mentioned above are the 21-4N and the TPM alloys, where lead corrosion resistance was of paramount importance in

the designing of these particular alloys.

The detailed analyses of these various materials (Table I) shows what was done to improve the corrosion resistance. Higher alloy contents are used in the 21-4N and TPM than in the earlier analyses, which contributes to the physical properties as well as to the corrosion resistance. It should be noted that the high silicon contents advocated in the early valve steels have been drastically reduced in these two materials. It has only been recently that the effects of silicon as well as other low concentration elements have been fully recognized.

The influence of silicon in the typical 21 per cent chrome, 15 per cent nickel austenitic valve steel shows that relatively low concentrations of silicon can have a deleterious affect on the corrosion resistance (Fig. 3). Silicon of 0.5 per cent produces the most rapid corrosion of the steel whereas reductions in the silicon content drastically reduce the corrosion rate. Increasing the silicon concentration above 0.5 per cent also reduces the corrosion rate, but to a lesser extent. The variation in corrosion rate with silicon above this concentration is small, however, and it is easy to appreciate why the true effects of silicon remained clouded for many years.

Austenitic valve steels using manganese in place of nickel have received a good deal of attention. The effect of silicon in these steels (Fig. 4) is similar to that in the chrome-nickel steel. Our data does not go to sufficiently high silicon contents to determine whether or not there is a maximum to the corrosion rate but there appears to be a point of inflection in the curve at about 0.5 per cent silicon. The relatively rapid change

(Turn to page 116, please)

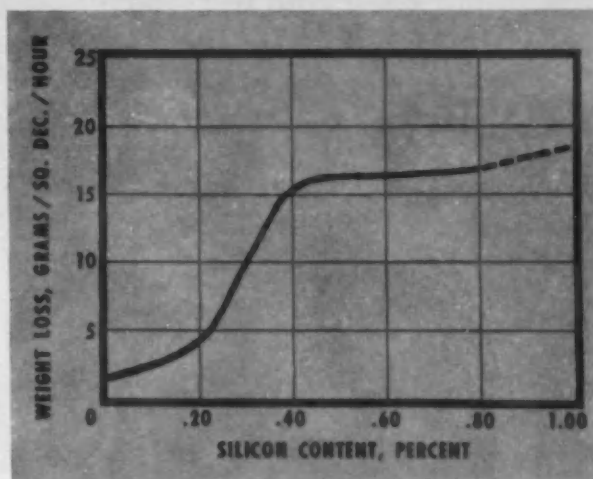


FIG 7—Corrosion resistance of 20 per cent chromium, 15 per cent nickel, 15 per cent cobalt steel

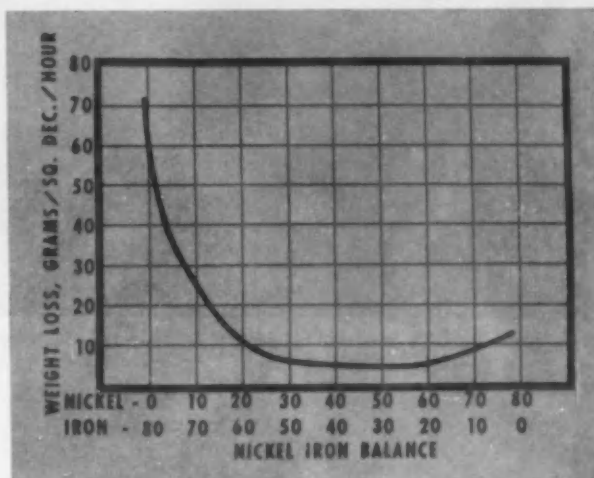


FIG 8—Corrosion resistance of 20 per cent chromium, 0.15 per cent carbon plus nickel and iron as shown

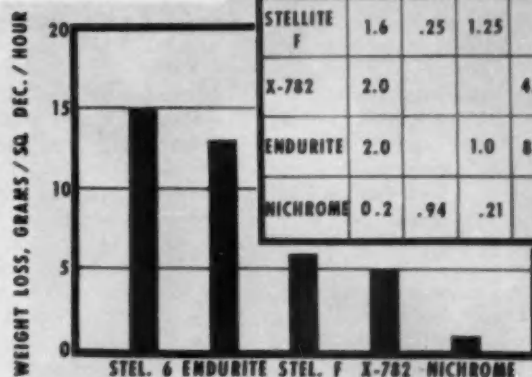
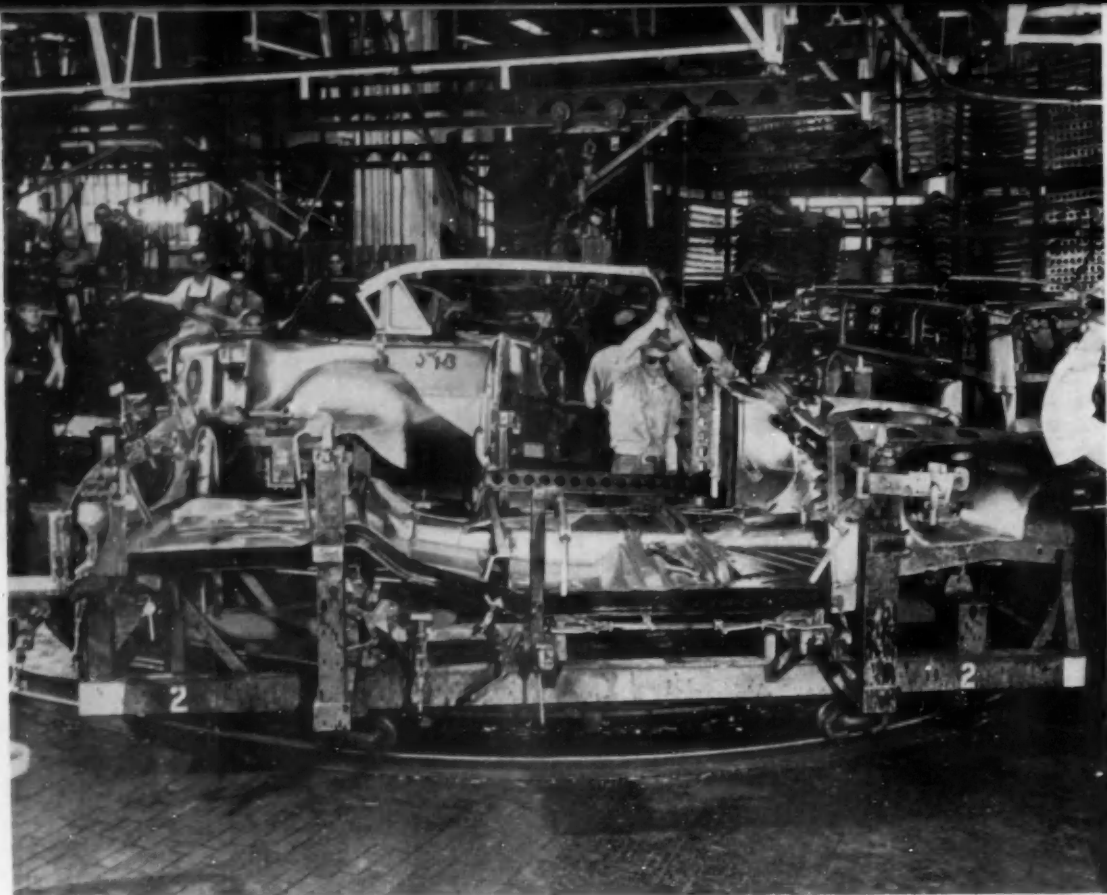


FIG 9
Corrosion resistance of conventional valve facing alloys

	C	Mn	Si	Pb	Cr	Ni	W	Co
STELLITE 6	1.05	.06	1.21	2.0	27.6		4.25	BAL
STELLITE F	1.6	.25	1.25		24.0	24.0	12.5	37.0
X-782	2.0			4.0	25.0	60.0	8.5	
ENDURITE	2.0		1.0	8.0	29.0	39.0	13.15	10.0
NICHROME	0.2	.94	.21	.80	20.25	77.1		

TABLE II
Analysis of valve facing alloys



Single-unit body construction is process on a merry-go-round in the Milwaukee body plant. The body and frame are joined into one unit with 8,000 welds.

Seven Lines of Cars *on* One Assembly Line

PLANNING and preparation for production of seven lines of completely restyled and redesigned passenger cars was accomplished at American Motors' Kenosha, Wis., plant in eight months, following the merger of Hudson and Nash-Kelvinator last year.

A major factor in the short-term integration of the 1955 Hudsons with the new Nash and Rambler models was American Motors' "single-unit" type of body construction which eliminates the conventional chassis frame. This basic body used for both Hudson and Nash cars is produced in the Milwaukee body plant and delivered to the Kenosha assembly line ready for final addition of major components. It is in final assembly that the cars assume their separate identities.

Considering engine and styling differences, seven separate lines of cars are produced on a single assembly line in the Kenosha plant. They are the Nash

Ambassador 6, the Ambassador V-8, the Nash Statesman, the Hudson Hornet 6, the Hornet V-8, the Hudson Wasp and the Rambler. Within these different series are the wide variation in Hudson, Nash and Rambler models.

Nerve center of the flow of materials to the proper stations is the scheduling office where instructions are sent to 26 control points in the factory by means of Telautograph machines. Thus, the proper-colored wheels are loaded on the conveyor to arrive at the assembly point at the same moment the matching body arrives.

Nash and Hudson "single-unit" bodies arriving from Milwaukee by trailer (Rambler bodies are built in Kenosha) are transferred to a 325-ft conveyor which delivers them to the body storage area. Sixteen storage conveyors, each 570-ft long, provide total storage for 629 bodies.

Upon instructions from the scheduling office, bodies



Unfinished Rambler bodies pass along the "carousel" production line at the American Motors body plant. Here the body shells are receiving final wet sanding and smoothing, prior to bonderizing and painting.

are transferred from the storage area to the make-up line. At the same time the body moves to the line, all delivery and sub-assembly conveyors are loaded according to the time schedule broadcast by the Teletograph machines. Only 10 minutes elapse from the time the body passes from the temporary storage area until the finished car rolls from the final assembly line.

Moving sideways down the make-up line, the body is wired and fitted with steering gear and front-end suspension. At the end of the conveyor, the body is hoisted to an overhead line and moves to the engine installation point. There a team swings the assigned

power-plant into position. V-8 engines are guided into position from a high angle; six cylinder engines are lifted into place from under the engine compartment.

The rear axle is installed next, and the body moves to the front-end sheet metal assembly line which resembles a huge "lazy Susan" on which grilles, fenders,



Grilles, fenders, radiators and headlights for Nash and Hudson cars are assembled on this huge "lazy Susan" located near the final assembly line in the Kenosha plant.



The right engine for the right car is always ready on the single assembly line through the time schedule broadcast by the Telautograph machines.

radiators and headlights are assembled on an endless oval of moving platforms. Hooks deposit the completed front-end in position and the car assumes its final identifying appearance as a Hudson, Nash or Rambler. Bumpers, mufflers and tailpipes installed, the car is ready for its sprint to the finish line.

Engine installation station. Here a V-8 engine is guided into position from a high angle. Six-cylinder engines are lifted into place from beneath the engine compartment.



An overhead chute is waiting with five wheels scheduled for the individual car by the Telautograph system. Seats, floor mats, spare tire and battery are installed. The engine receives its gas, oil and water and the car is driven from the line.

Before reaching the shipping point, each car is put through a series of "test rolls" which permit the inspector to observe the braking and transmission action while the car remains stationary. Front-wheel alignment is inspected and the car is checked against the customer's order specifications.

Flow of parts and materials to the assembly line is coordinated by means of Telautograph messages flashed to 26 control points in the plant. Here, Nash and Hudson single-unit bodies move along the make-up line after leaving the storage area.



EXPERIMENTAL

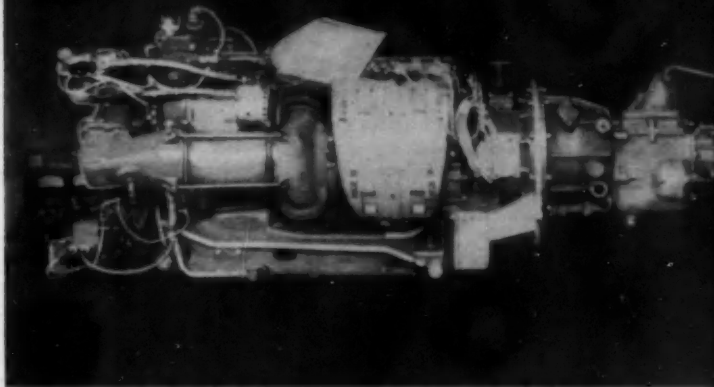
Race-Type Car

Has

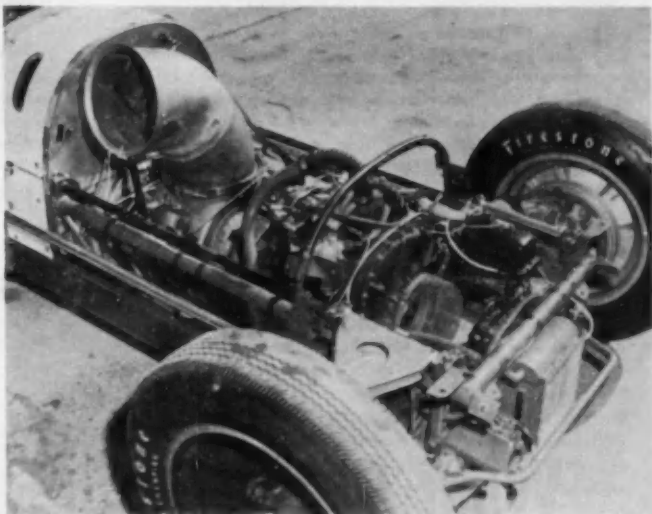
Gas Turbine Engine

FIRESTONE and Boeing, with the cooperation of the U. S. Air Force, have teamed up to develop a race-type car with a gas turbine engine. Firestone's purpose is to use the car for tire testing while Boeing is interested in getting performance information on its Model 502 gas turbine in a light vehicle. This car, equipped with the new Firestone front wheel racing tires, was exhibited at the Indianapolis Speedway. The car is definitely for test purposes and was not entered in the famous "500" nor will it be used in future formal competition under the present development program. The car is reported to run very smoothly and to have extremely rapid acceleration.

Views of the old and new Firestone Indianapolis front wheel racing tire. The new tire on the right has a slightly narrower tread for improved front and rear balance and features a thicker tread for increased wear. Size has been increased from 7:10 x 16 to 7:60 x 16, and it has a six-ply nylon cord body. The new tire has two circumferential grooves.

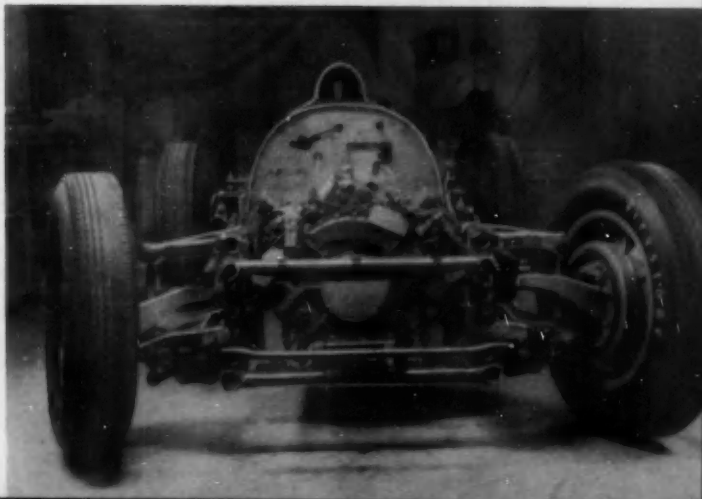


The Boeing 502 gas turbine used in the Firestone race car develops 195 hp. Compressor speed is 37,500 rpm and the output section has a reduction of 8 to 1. It burns about 40 gallons of fuel per hour and weighs about 250 lb. The transmission is used only for reverse. Torque reaction from the transmission and the bell housing is transmitted through a short rigid box member.



The gas turbine engine was easily installed in a Kurtis 500 series chassis, and mounts much lower than a conventional engine. Weight of the car, with fuel load, is 2200 lb.

A strap from the top frame rail carries the rear of the engine and a brace from the bottom frame rail positions it sidewise. Oil cooler, exhaust system, and intake screen are not installed.



MACHINE tool builders are in the automobile business by being associated with car producers in the design and manufacture of the equipment with which we in the automotive industries manufacture our products. In this area, technological progress has been tremendous during the past 35 years.

General Motors gives a great deal of credit to the machine tool producers for the progress that has been made. That industry has done a wonderful job in designing and building equipment to suit our needs, and has succeeded in meeting delivery dates that at times seemed impossible to achieve. In the purchase of machinery, we have always wanted to get the most value for our money and have purposely created a competitive situation among the tool builders which undoubtedly urged them on to greater effort. It has been our practice to submit parts prints to several machine tool companies and give each an opportunity to use its ingenuity and technical skill in proposing machinery and tooling to accomplish a desired result.

Technological improvement has been going on continuously and we can see no reason why it should stop. We once used single-purpose machine tools, grouped them in departments by type and then dragged our product from department to department. During this period more progress was made in improving machinery than in the method of manufacture. We were able to get more pieces per operator but we had more people dragging material around.

So we attacked this problem and rearranged our machinery in lines to make a particular part in a successive series of operations, and we built plants to make individual products. Then we found we needed changes in machinery to make it more adaptable to this type of arrangement. And why? Because we had difficulty building chutes, conveyors and hoists to suit the shape, configuration and

By Rodger J. Emmert
Executive in Charge of Facilities and Processes

Manufacturing Staff
GENERAL MOTORS CORP.

IN this article, Mr. Emmert expresses the top management views of the needs and desires of the General Motors Corp. regarding machine tools. He gives a factual straight-from-the-shoulder report on GM's continuing technological activity to improve its product by better production processes. Mr. Emmert also tells why the word "Automation" is taboo at General Motors

What General Motors Expects of the

controls of the machine tools we had. This process of eliminating handling between operations is still going on. We are using our ingenuity more and more to devise mechanical means of doing this. The latest development to accomplish this is a straight line process machine. Some people call this "Automation," but around our shop this word is taboo. I discourage our engineers from using the word because nobody knows just what it means. Some people who like to write and talk, but don't know what it means either, freely write about it and describe their most fantastic dreams. The word "automation" is new, but the process as I know it is old. We are doing the same thing now that we have been doing in General Motors' plants during my 36 years of experience—that is, using mechanical means to handle material, and horsepower, applied through machinery and equipment to do the heavy work. Of course, equipment and machinery is getting more complicated. The equipment that controls it has become a large and important part of the machine.

Machine tool manufacturers have the organization

personnel and engineers who are capable of producing most any kind of a mechanical arrangement to accomplish a desired result. But the management must have the urge and determination to make progress, and must provide the drive to attain results that the customers think most desirable. What do we wish to accomplish?

First of all, we place at the head of the list—improved quality of our product. Secondly, we wish to produce parts at a lower cost. Third, we desire great reliability in order to maintain the continuity of production. Fourth, we must give consideration to the capital invested in facilities.

How can we assist you, our partners in this business, in accomplishing this with respect to machine tools? What suggestions do we have to offer you? Here we get down to specific things.

GM Engineers have set down on paper standards and specifications of elements which we desire be incorporated in mechanical systems. We have classified these as electrical, hydraulic and pneumatic standards. These stand-

ards cover not only details of arrangement but also the type of components desired in the system. These standards have been published in pamphlet form for all those who desire and can use the information. The use of these standards has not only improved our safety position but has definitely contributed to increased production due to more continuous operation of equipment with less down time for maintenance.

What do these specifications seek to accomplish?

1. That components used in these systems be rugged to stand up under production pounding.
2. We wish these components to be so located that they are not damaged by chips, coolant, oil and dirt.
3. They should be so located that our maintenance people can get at them readily for adjustment and repair.

Drilling Equipment

We recently made a survey of our master mechanics to determine what they desired in the improvement of drilling, milling and turning machinery.

With respect to drilling equipment, 34 per cent of the recommendations submitted were for improvement directed toward reducing maintenance; 27 per cent for improvement of accuracy; 21 per cent for greater flexibility and operating ease; and nine per cent were for the provision of greater safety to the operator. Specific requests were for more rigidity, more positive depth control and better spindle lubrication.

Regarding standardization, the most prevalent suggestion was for a standard spindle nose for attachment of multiple heads, and the second request, which applies to power drilling units, concerns the standardization of mounting bases, attaching holes and the dimension of base to spindle.

Machine Tool Builder

Milling Equipment

Regarding milling equipment, the following suggestions for improvement were made: 1. greater rigidity and strength; 2. centralization of lubrication system; 3. better means for chip disposal; 4. larger spindle nose; 5. higher spindle speeds; 6. greater spindle horsepower provided greater rigidity accompanies it; 7. improve spindle and feed drive to reduce chatter; 8. chip protection on moving parts, bearings and ways; 9. eliminate lubrication leaks.

The most prevalent suggestion received for the standardization of milling machines was for a uniform location of T-slots in the table.

Turning Equipment

Under the subject of turning equipment, our master mechanics have thought that consideration should be given to those elements which affect: 1. the cycle of operation and quality of work produced; 2. maintenance; 3. stocking and service requirements.

They requested the following improvements be incorporated in turning equipment:

1. Increased power, speed and rigidity to eliminate vibration and chatter, and permit optimum use of tungsten carbide tools.
2. Improved chip handling and coolant cleaning by improving means of removing chips from machines and by the addition of filters or a centrifuge to remove minute chips from coolants.
3. Improve means of applying coolant to work and eliminate overflow and splash.
4. Improve alignment of indexing mechanisms and turrets.
5. Improve safety features, eliminate loose wrenches and add mounting bosses for better guard application.
6. Improve seals to keep coolant from getting into lubrication and hydraulic systems.
7. Install better means of leveling and maintaining level after initial installation.
8. Improve clearance for accessories and tool setting.
9. Improved lubrication systems.
10. Permit better accessibility to high maintenance components.

In analyzing the suggestions for standardization of components, the following were noted: 1. Standardization of tool mounting for interchangeability between machines. This includes pilots and bolt hole sizes and location of tool holders and adapters on turret faces for hand screw and semi-automatic turret lathes. 2. Standardization of work spindle pilots. 3. Standardize spindle noses to permit interchangeability of chucks, face plates, etc.

4. Standardize collet shapes, feed fingers and pushers. 5. Standardize center distances from slides to spindles for interchangeability of tools. 6. Standardize work head and tail stock center tapers.

Grinders

The standardization of the nose of grinding wheel spindles is being requested repeatedly. In GM we have standardized on the external dimension of wheel mounts, but this only partially solves the problem since the internal dimension must be made to fit the particular grinding machine on which it is to be used. Our master mechanics state they are most interested in large grinders such as used on crankshafts and camshafts.

Many suggestions have been made to standardize working dimensions. Please let me emphasize that we have no desire to limit you in your ingenuity or freedom to work out new designs. We speak about those areas with which we must work. Our recent experience with setting up facilities for the production of military items emphasizes this thought. In a war economy we would have to use whatever machinery we could get. Modifications of tools to suit machines is a costly and time-consuming job, and the time may not be available.

When new designs are laid out standardization of this type previously worked out and agreed upon by you should be considered.

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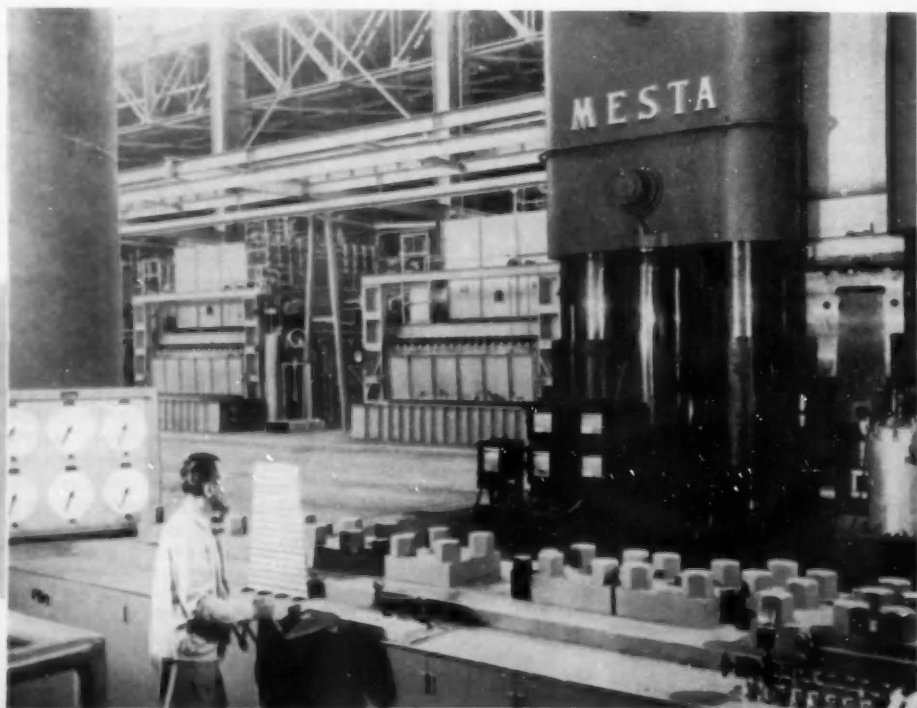


Special Equipment

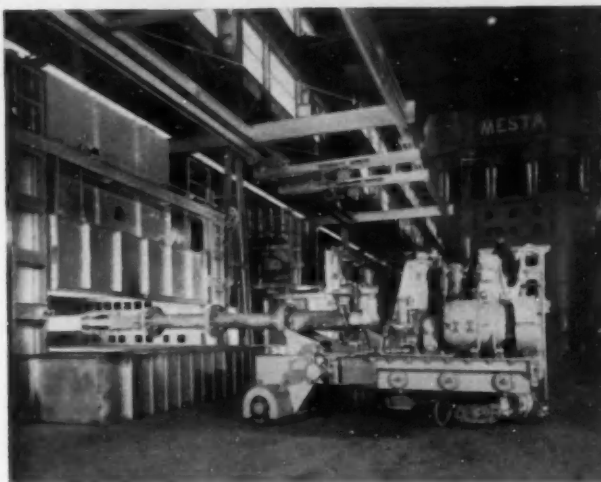
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AIR FORCE HEAVY PRESS PROGRAM

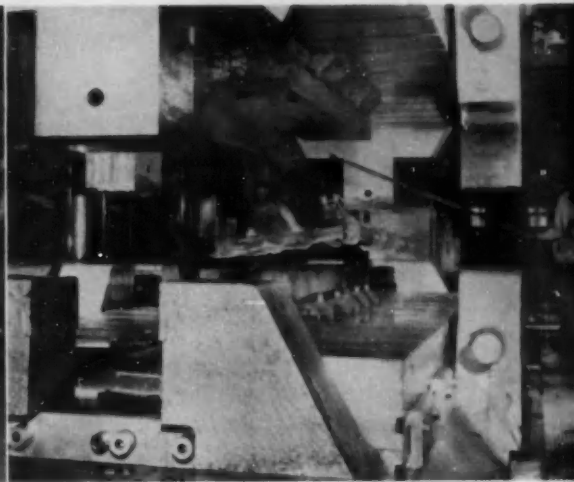
The 35,000-ton hydraulic closed die forging press built by United Engineering and Foundry Co., and behind it the 50,000-ton press by Mesta Machine Co. Hydraulic pressure bottles are shown on left



Operator at controls of the larger press. Pressure events in background



Manipulator removes forging stock from a preheat oven



Wing spar forging being removed from the 35,000-ton press after the first blocking operation

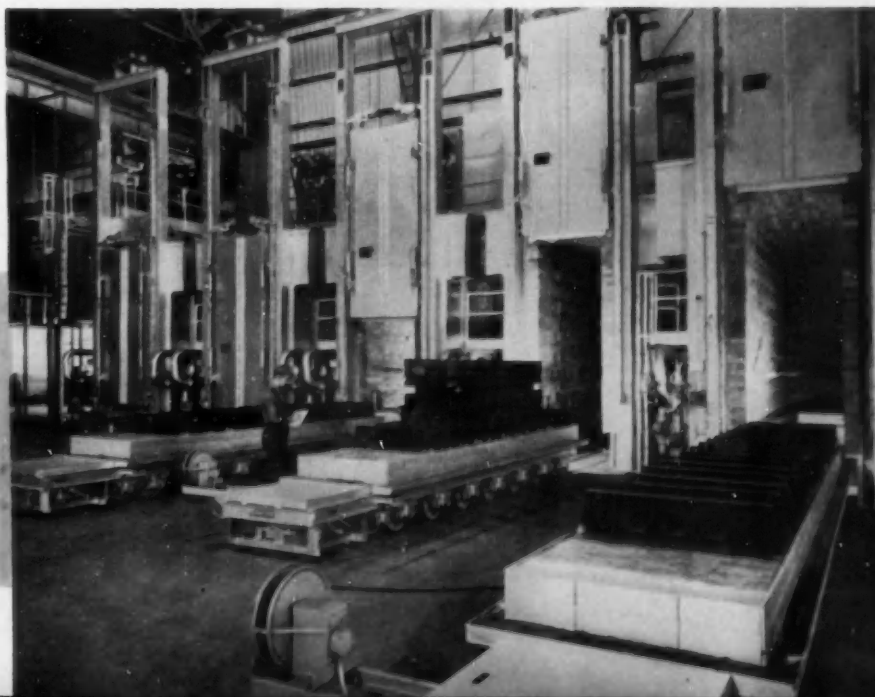
PRODUCTION of huge aluminum forgings for military aircraft is under way at the Cleveland Works of Aluminum Co. of America. The Air Force and Alcoa dedicated the plant, AF Plant No. 47, at ceremonies held last month. H. E. Talbot, Secretary of the Air Force, announced that the AF heavy press program now has five presses in use, of the ten in the present program. The others are scheduled to be operating by the end of this year. (See AI, Dec. 1, 1954, page 69, and May 15, 1955, page 38.)

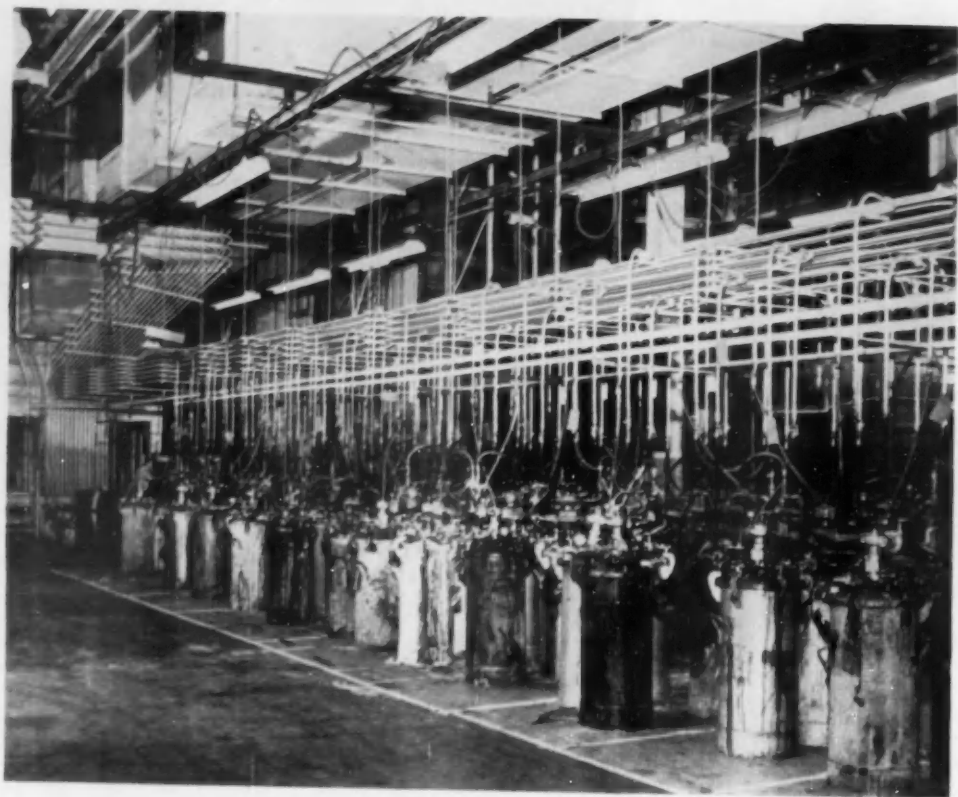
Under present AF production plans, the new plant:

has excess capacity available for commercial forging work. Logical field is transportation—commercial aircraft, railroad equipment, and truck structural parts.

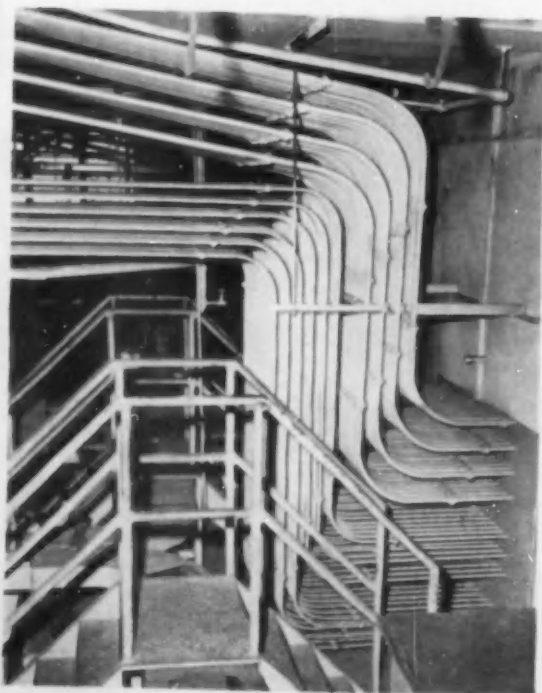
In addition to the 50,000-ton and 35,000-ton presses, the plant includes a \$6 million die shop and four smaller heavy presses. The two large presses are supported by 19 soaking furnaces and nine car-bottom die heating furnaces, a large scalping machine and three large saws, six straightening presses, a trim press, and quality control equipment for die-penetrant and ultrasonic inspection.

Die preheating ovens for both presses





Pressure pot circulation system for 42 interior colors.



There are 94 paint circulating lines supplying each booth.

Automatic Painting

AT the Los Angeles Plant of the Chrysler Corp. a single spray booth is equipped to spray 94 different colors! Put into production in the fall of last year, the paint system of Chrysler Los Angeles embodies all the advances made through the years plus a few of their own. Even though the problems of scheduling are tremendous because of the many colors, automatic spraying of hoods, fenders, wheels, and whole bodies is accomplished with ease and with quality only matched by the most experienced spray men.

The plant was expanded in 1954 to take on the increasing West Coast business, and included were the most modern paint facilities obtainable. The Paint Division is on the second floor of a new building, and occupies 180,000 sq ft of floor space.

Bodies are assembled and metal finished on the first floor and delivered to the second floor paint operation by a unique vertical conveyor designed by Chrysler engineers.



By O. A. Egeler
Plant Engineer
Chrysler Motors California
Los Angeles Plant

Hoods, Fenders, Wheels, and Complete Bodies Sprayed in Automated Setup at Chrysler's Los Angeles Plant

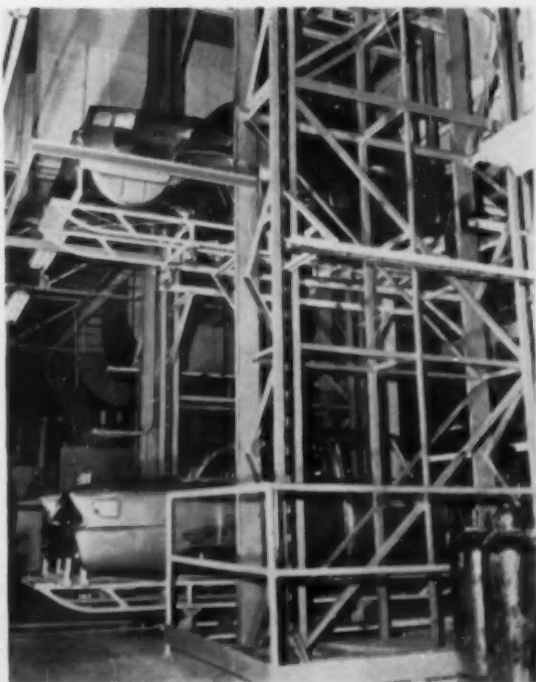
Pump room for 52 exterior colors. There is a stand-by pump and drum for each color.

of Passenger Cars

Arriving at the second floor paint operations, the body is removed from the body truck and installed on an overhead power-and-free conveyor. From here it travels through the Bonderite and Bonderite dry-off, into the prime spray booth. Interior of the body, window reveals, etc., are hand sprayed, and as the body progresses through the booth, the underbody is automatically primed through the use of seven pre-set guns. This operation is barely completed when the body passes through an infrared beam that actuates automatic spray guns to spray the sides and tops. After the prime is oven-dried an underseal is applied to the body, after which it is removed from the overhead conveyor and again placed on a floor type body truck.

The body then progresses down the conveyORIZED line for sanding. An innovation at this plant is the elimination of the wet sand deck. The entire body is dry sanded. Dust from the sanding opera-

(Turn to page 110, please)



Bodies are raised on this vertical conveyor



This special Match & Merryweather machine, one of three which Ford operates in the Dearborn Engine Plant, rough and finish grinds the heads of valve tappets.



NEW METHODS for Valve Tappet Production

VALVE tappets are produced in unique fashion in Ford's Dearborn Engine Plant, emphasizing some new methods and specialized equipment brought into being only a short time ago.

Blanks for tappets are produced in the cold heading department, delivered to the machine shop and loaded by conveyor into a bin. They are then distributed by automation on a conveyor system feeding a battery of three special Match & Merryweather cylindrically shaped grinders for grinding the cap. As illustrated.

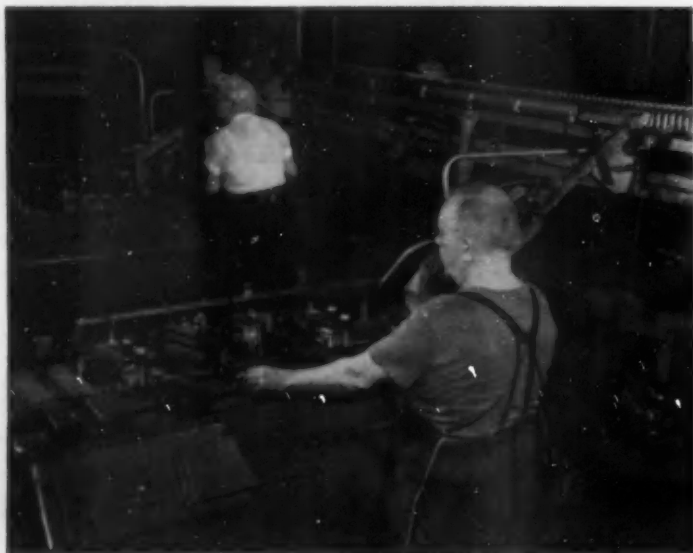
these grinders accommodate a large number of parts around the periphery of the fixture. The machine has four grinding heads, two for roughing, two for finishing.

At each of these machines the feeder conveyor loads a special hopper, which may be seen in the illustration, and this, in turn, sorts the tappets and feeds them into a magazine. The latter then serves to move the tappets to the machine, loading into the fixture automatically.

Automation then transports the work through a series of additional operations—wash, carbo-nitriding in Surface Combustion furnaces, quench in oil, wash, and draw.

The work continues through a battery of Cincinnati centerless grinders for grinding of the stem. As illustrated, the work is transported on a narrow conveyor belt system, the upper belt delivering tappets to individual grinders by loading the hoppers which, in turn, feed the parts one by one through a magazine. The lower conveyor belt receives the ground parts as they emerge from the grinders.

From here they go into magazine-loaded Hoern & Diltz multiple spindle machines for finish grind-



After valve tappets have been heat-treated, ground and washed, they are fed by automation to these Marx electronic inspection machines.

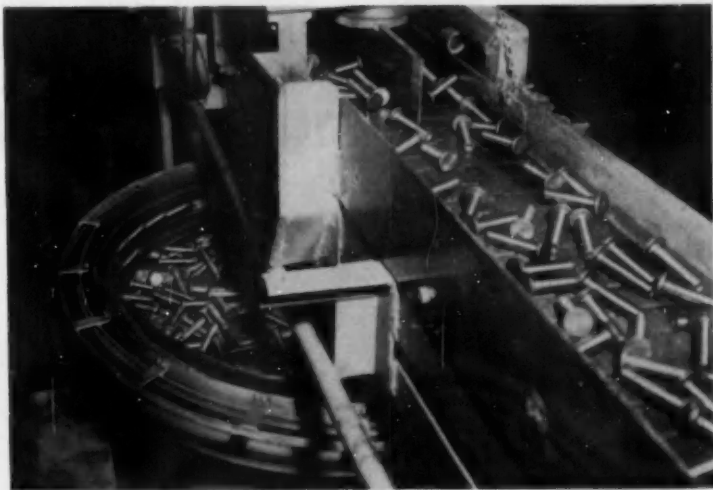


One of a battery of Cincinnati centerless grinders for grinding the stem diameter of the tappets.

ing of the cap, and then are transferred to another group of Cincinnati centerless grinders for finish-grinding of the stem.

At the completion of these operations, the tappets are washed, then fed by automation into another conveyor leading directly to Merz electronic inspection machines. Tappets are fed automatically to the conveyor by sliding them into clamping fixtures in the side of the conveyor chain.

The Merz inspection machines are quite similar to others installed at Ford recently. On tappets they check for roundness, taper, hardness, length, and chamfer, ejecting the accepted parts directly to a man who visually inspects them. At the rear of the machine are reject chutes for various types of rejects.



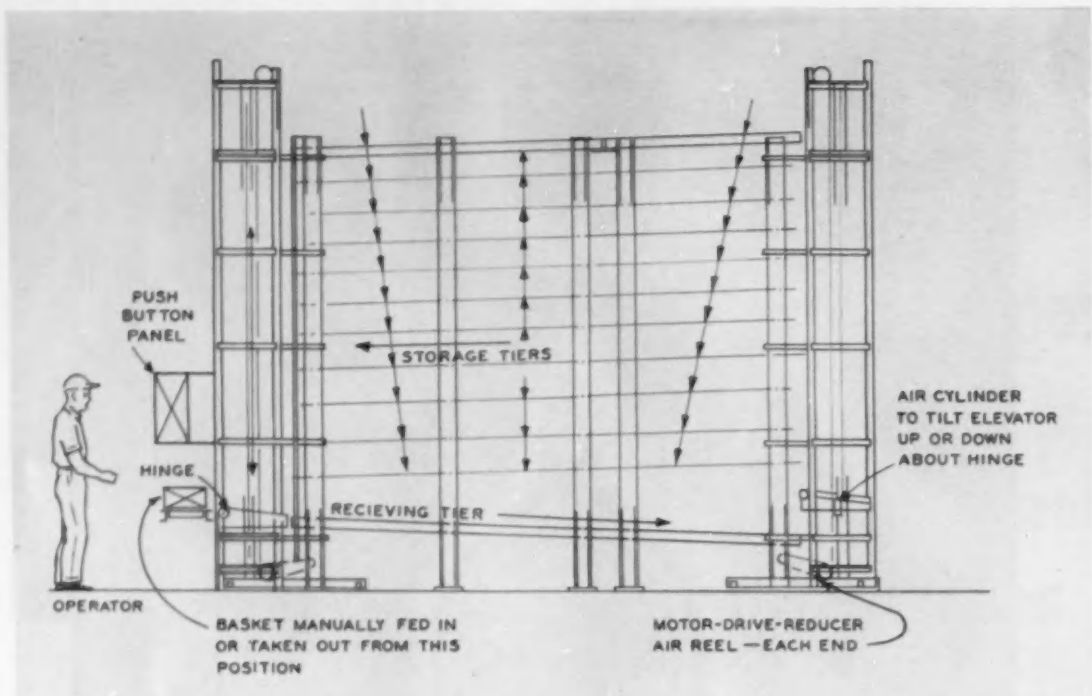
Close-up of the conveyor and hopper which load the tappet head grinding machine. A baffle directs the parts off the conveyor into the hopper which arranges them in one direction and feeds them into the grinder.

White Sales Off Slightly

Although sales of trucks and parts by White Motor Co. increased about

\$1 million in the first quarter, defense business declined, and total sales dropped by more than \$1.7 million to \$38.8 million. Earnings also

fell slightly to \$1.1 million compared with \$1.2 million in the like 1954 quarter. A sharp drop in defense work this year was responsible.



Stacking units, arranged in groups, for storing parts ahead of heat treatment and for scheduling to grinding department afterwards.

AUTOMATED SETUP for Handling of Workpieces

PRODUCTION of gears and shafts for four-speed and five-speed Ford tractor transmissions is subject to exacting procedures at the Ford Highland Park plant. All gears are shaved after hobbing or shaping as the case may be; most are shaved in the green; several that require an extra heavy case are first carburized, then shaved. It is also of interest that all gears for the five-speed transmission, except four, are finish-lapped after heat treatment. The remaining four gears are burnished in special Sheffield machines.

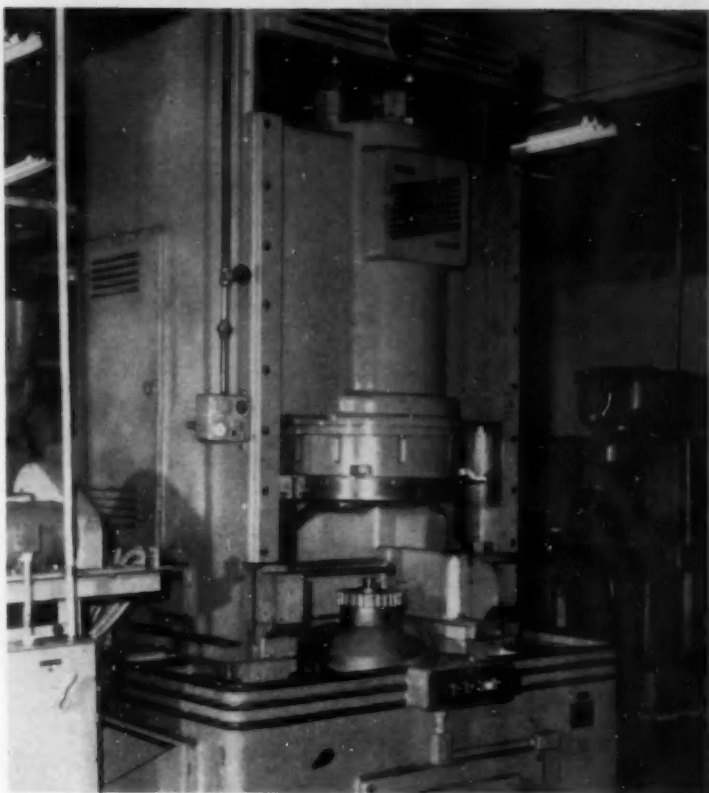
Working with a wide variety of gears and splines, Ford has installed the best known types of equipment known to the art; Fellows gear shapers; Lees-Bradner hobbers of single- and multiple-spindle types; one of the large Michigan Tool hobbers; several of the largest of the Michigan Tool Shear Speed machines for the bull gear of the final drive; National Broach Red Ring gear chavers; a large battery of Michigan Tool gear lappers.

Perhaps one of the most outstanding features of the gear and heat treat department is the unique system of automation devices for storing parts ahead

of heat treatment and for scheduling to the grinding department afterwards. It consists of the installation of some 10 stacking units, arranged in groups as shown.

Since the operation involves a fairly large number of gears and shafts, we have selected three examples for more detailed study—the output gear, countershaft, and the main shaft or gear cluster.

Largest of the individual transmission gears, the output gear, starts as a forged blank normalized at 1650 F to facilitate machining. Preliminary blank operations—drilling, chamfering, facing, boring, and reaming—are handled in eight-spindle Type D Bulard Mult-Au-Matics. Broaching of 10 splines is done in a 15-ton, 48-in. stroke, two-station LaPointe broaching machine of vertical type, using pull-up broaches. Rough-turning of OD's and straddle-facing the gear faces is handled in No. 12A Sundstrand automatic lathes; followed by finishing of the same faces in another Sundstrand setup. The 55 LH helical gear



Close-up of one of the large Michigan Tool Shear Speed gear shapers used for cutting the bull gear teeth.

matic internal grinder, holding surface finish to 10-15 microinch; then the hub diameter is finish-ground in a Landis external grinder, holding surface finish to 15-20 microinch. Turning and facing of hub diameter is done in an Ex-Cell-O, two-spindle, single-end precision turning machine. Then the hub and cone at one end are superfinished in a No. 54 Gisholt Superfinisher of two-spindle type, holding the hub to 10 microinches, the cone to five microinches, maximum.

The work is washed, sound tested in the booth, using a GSJ Red Ring gear speeder. Gear teeth then are finish-lapped and the gear given a complete inspection.

The main shaft is easily the most intricate of the transmission parts from the standpoint of process, since it includes six gears as well as a splined section. First operation is milling to length and centering in a Sundstrand two-station machine. Rough-turning is done in successive steps in 12 x 22 Gisholt automatic lathes; finish-turning and facing in Fay automatic lathes.

(Turn to page 122, please)

In Ford Transmission Plant

teeth then are cut in Lees-Bradner hobbers.

Except for some minor operations, the work is ready for heat treating. It is washed enroute, carburized in a Holcroft batch type gas-fired furnace to produce a case depth between 0.030 and 0.040 in. It is washed again, the gear faces straddle-milled in a Sundstrand lathe, and the teeth crown-shaved in a GCU-8-in. Red Ring gear shaver. These operations are followed by green inspection, green speeder testing in the sound booths. Final operation ahead of grinding is induction hardening of gear teeth, hub, and cone in a Weltronic machine. The part then is given a draw for one hour at 375 F and shot-blasted.

In the grinding department, the cone is finish-ground in a No. 271 Heald Size-

Gun drilling of the hole through the countershaft is done in this four-spindle W. F. & John Barnes machine.



New Czechoslovak seven-ton truck, the Tatra 137, is powered by an eight-cylinder, aircooled Diesel engine. Steering column gear lever controls the full synchromesh transmission. Drive is to all four wheels. Split axles at the rear are independently sprung. This is a prototype model now under test.



Concessions to American styling are evident in Russia's Volga M-21 which is now coming off the assembly lines at the Molotov Auto Works in Gorky. The body features wrap-around windshield and hooded headlights.

New Communist Vehicles



New four-door model of the Russian Moskvitch made at the Midgast Cars Works in Moscow. Engine output is increased to 35 hp, and top speed is to be 65 mph. It includes built-in radio and heater.

PISTON RING CASTINGS

*Improved
by
Shot Blasting*



Fig. 1—Close-up of one of the 18-cu ft Pangborn Blastmaster barrels for cleaning loads of sprues and risers in preparation for remelting. Note the power loading device and conveyor serving the barrel.

IN search of improved quality control, the Sparta Foundry Division of Muskegon Piston Ring Co. placed in operation a few months ago a battery of four huge Pangborn Blastmaster barrels for shot blasting piston ring castings. The primary objective was to effect accurately controlled blast cleaning since rings are becoming thinner and overblasting could result in warping. In addition, MPR wanted a better definition of the engraving on the side of piston rings as well as of the power groove in small rings.

It is noteworthy that while optimum quality control was attained, this Pangborn installation effected production economies of such character as to make quality simply a byproduct of low cost operation.

In the first place, the battery of four Rotoblaster replaced the original installation of 16 pieces of other equipment and in the process it released a considerable amount of valuable floor space. Similarly, the adoption of conveyor equipment and power loaders reduced manual effort and increased safety of operation. Finally, the introduction of automatic timers, designed to shut off the machine at a specified time, has made it simple for one operator to tend two or three machines without additional effort.

Figure 1 shows one of two 18-cu ft capacity barrels used for cleaning sprues and risers. Equipped with power doors and automatic loading and unloading devices, each machine is capable of handling 16 to 18 cu ft of sprues and risers in two or three minutes. A thorough cleaning job on these parts makes them suitable for immediate remelting.

Two smaller Blastmasters—one of them seen in Fig.



Fig. 2—One of two smaller—12-cu ft capacity—Pangborn units used for cleaning piston rings. These machines too are equipped with automatic loading and unloading; and, in addition, have automatic shut-off devices.

2—handle 12-cu ft loads of piston rings. Here the introduction of power loading and unloading, combined with automatic shut-off, makes it feasible for one operator to tend two or three machines.

Supplementing this equipment is a big Pangborn dust collector mounted outside the cleaning room. Not only does it improve housekeeping within the cleaning room, making it a good place to work, it also makes Sparta a good neighbor by preventing dust and dirt from contaminating the surroundings.

AUTOMATION NEWS REPORT

← FEEDBACK →

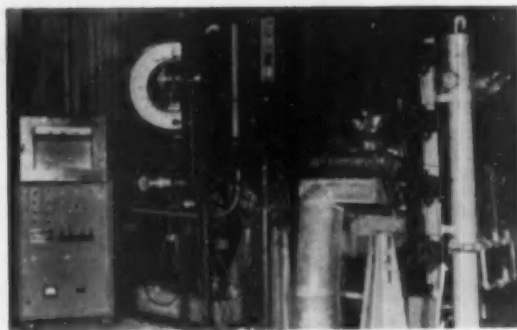
AUTOMATIC CONTROLS
PRODUCTION — VEHICLES — AIRCRAFT

By Paul Kennedy

METHOD FOR DATA

Aircraft manufacturers who predict performance of new airframe designs with standard jet engines, may be interested in a new system announced by the Aircraft Gas Turbine Div. of General Electric Co. Their engineers have worked out a method for getting answers to a greater number of questions concerning the engine's performance in a proposed airplane, in less time than was possible previously. The division uses an IBM type 701 electronic data processing machine.

Characteristics of each engine are recorded on about 175 calculator cards. Previously, the characteristics were used in the form of scores of charts, graphs and tables. It takes about one month to make up a set of engine data cards, but much less time for a set of airframe data cards. Both sets are fed to the calculator to get the needed information. GE says the



AUTOMATIC ENGINE TESTING

An engine program controller uses punched motion picture film for timing. California Research Corp., subsidiary of Standard Oil Co. of California, uses a 15-ft loop in either six or 12-hr cycle. Eight rows of holes permit eight switch positions every 15 seconds at the faster rate. These set start/idle, speed, load, temperatures, and stop. Speed is controlled by a closed loop servo, with a d-c tachometer generator. Load is set by a low torque potentiometer mechanically connected to the hand of the scale balance, with the rate potential being proportionate to the rate of change of engine speed. Water and oil temperatures are controlled by Minneapolis-Honeywell thermoregulators. Control panel provides for trimming the variables as they stray from programmed values.

work of one man-year of manual calculating is turned out by the machine in two hours, once the cards are prepared. The method came from a group of engineers headed by T. F. Stirgwoit, manager of engine performance analysis, and D. L. Schell, manager of computer techniques development.

TRANSISTORS IN CONTROLS

Large-scale applications of transistors have received a great deal of publicity recently, perhaps obscuring some lesser-known but interesting new uses. In the consumer field, the Chrysler-Philco transistorized automobile radio was announced recently, while a tubeless electronic computer also was announced. With recent advances in the production of transistors, such firms as Bendix Aviation are able to use them. Bendix has flown an airplane with an all-transistor automatic navigation and landing system. Eclipse-Pioneer Div. developed the system following its success with a transistorized automatic pilot last year. Bendix's Paul A. Noxon, E-P chief engineer, reports work is going ahead toward equipment of all aircraft flight control systems with transistors.

Smaller companies also have some products for industry using transistors. A magnetic servo amplifier is now being offered with a transistor pre-amplifier, by Polytchic Research & Development Co. This device provides a voltage gain of 2000 to the control windings of Navy-type servo motors for closed-loop control systems.

DEFENDS TREND

Attacks on the so-called "new technology of automation" are based on "fear of change, on a lack of understanding of the process of automation, and the resultant fear of unemployment," a General Electric Co. engineer said last month.

Thomas W. Zebley of the company's General Engineering Laboratory in Schenectady told a meeting of the Institute of Radio Engineers in Binghamton, N. Y., that we must patiently create better understanding of automation. He pointed out that a gradual evolution of industrial mechanization has been in progress for more than a century, and added: "In General Electric we have been using automation equipment ourselves and developing it for others for over 40 years."

The future of industrial mechanization rests with the development of integrated systems of automatic equipment, Mr. Zebley said. Mass production techniques are slowed because "we currently rely on human activity to transcribe and transmit much of the information to and from office and factory." He continued:

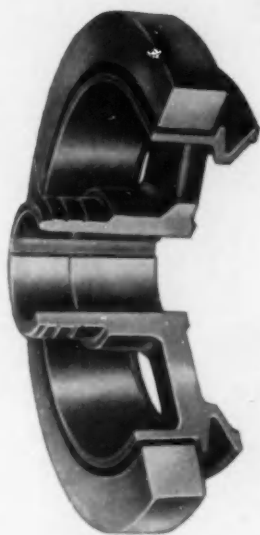
"As the fabrication, material transport, assembly and testing operations become more and more automatic (Turn to page 104, please)"

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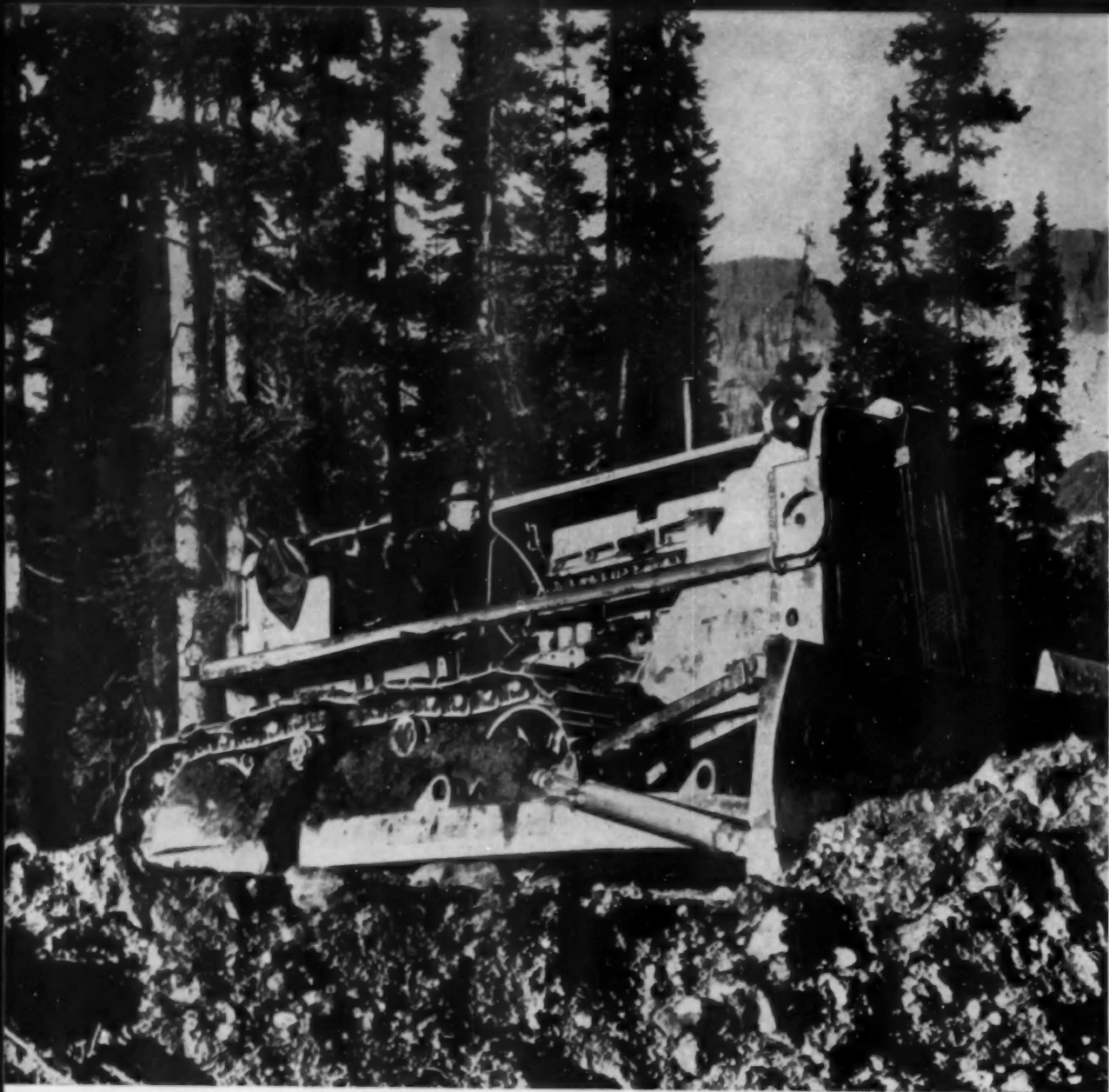
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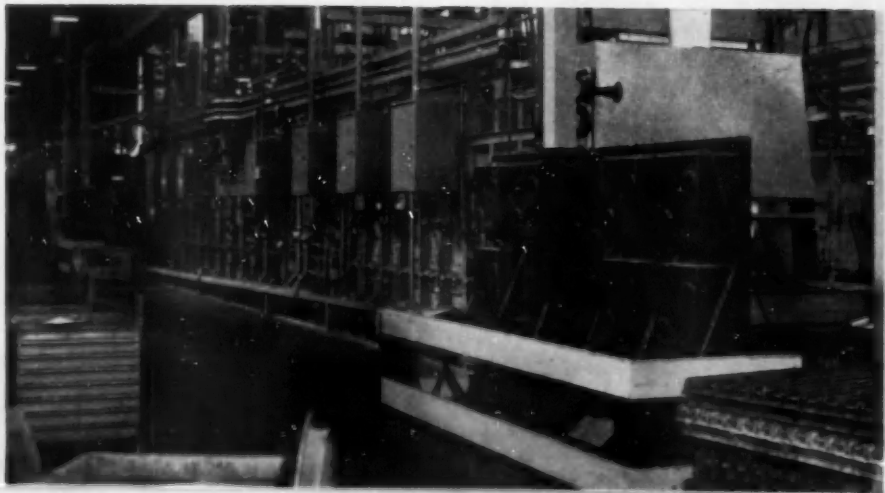
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Caterpillar bulldozers speeded construction on the Banff Windermere Highway at Mount Eisenhower in Alberta, Canada.

One of six at Caterpillar, this Westinghouse cycle annealer treats metals in a controlled atmosphere to avoid scaling.





Westinghouse annealers at Caterpillar® improve machinability

To insure quality products at competitive prices, Caterpillar Tractor Company is quick to study and test any new idea that might lead to reduced production costs and improved product performance. For instance, isothermal annealing of forgings before machining promised such results.

Installation of two Westinghouse cycle annealing furnaces demonstrated their value. Now Caterpillar uses six Westinghouse furnaces—some electric, some gas fired. Westinghouse tailored them to fit Caterpillar's precise needs.

These furnaces have proved they can produce the kind of microstructure allowing the highest rate of machinability and the desired finish. Here's another example of how Westinghouse engineers, working closely with the customer, help turn out a finer product at less cost. A call to your nearby Westinghouse Sales Engineer, The Man With The Facts, may produce heat-treating ideas for you, too.

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... IF IT'S A HIGH PRODUCTION PROBLEM ...

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TO GO FARTHER

FOR THE SAME 'FARE'

get a Transfer

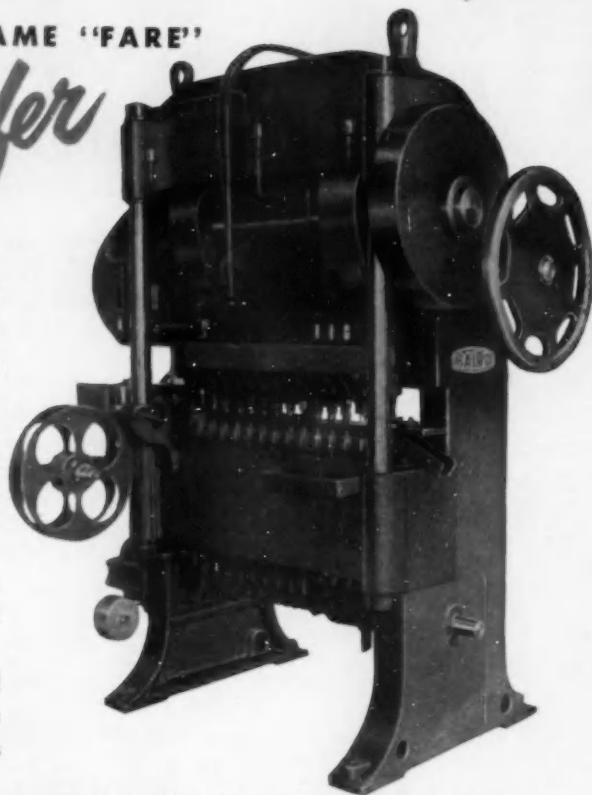
This one, completely automatic machine, the Baird Transfer Press, turns out accurately-formed metal parts at a rate of thousands of pieces per hour . . . often with 10 to 14 operations on each. Surely this is high production at its best.

Human-like transfer fingers automatically grip and carry the work to progressive die stations where blanking, drawing, piercing, embossing, slitting, trimming, sizing, hexing, forming, etc., complete the piece. Such operations combined in a single cycle definitely reduce costs to a great degree.

The machine pictured is but one of 12 standard sizes which have rated working pressures from 5 to 55 tons. Coiled stock up to 4" in width is automatically fed in feed lengths up to 3½".

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Performance records covering engines of all types in all kinds of service prove that Eaton Free-Valves increase valve life many times over the ordinary life expectancy of conventional valves.

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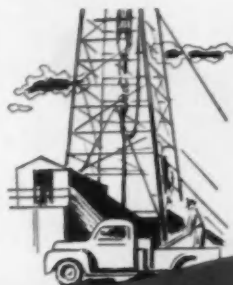
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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Forthcoming Machine Tool Show Among the Many Subjects Discussed at Spring Meeting of National Machine Tool Builders' Association

NMTBA 53rd Terrific

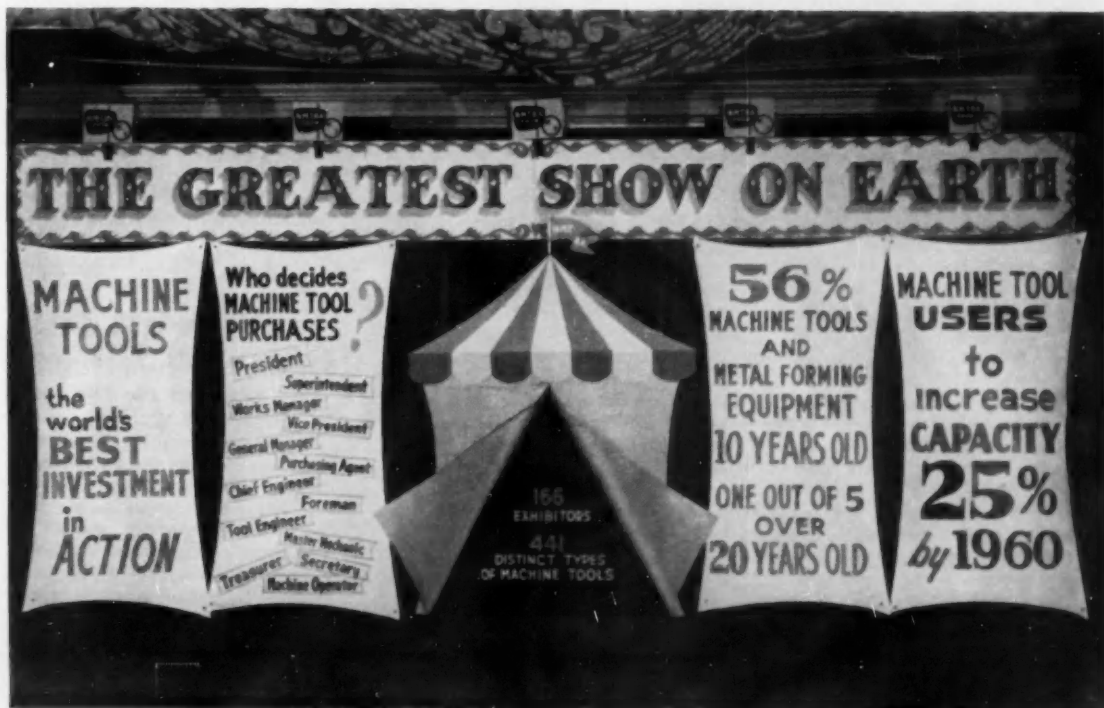
The National Machine Tool Builders' Association held an outstanding Spring Meeting—the 53rd—in Chicago last month. Machine tool manufacturers from all over the country packed into the meeting place to hear about the forthcoming Machine Tool Show, what General Motors wants in tooling (see page 60 of this issue), machine quality, and the various Association reports.

M. A. Hollengreen, NMTBA President, and president of the Landis Tool Co., led off business session with some very interesting comments on Government and labor. Concerning his recent trip to the Nation's Capital, he stated that the Government officials are not only conscious of the

role of the machine tool industry in the defense of the nation, but they are alert to the need to cooperate to make the industry's contribution to defense truly effective. During his opening address he said, "I often wonder if, in all our talk and thinking about selling, we ever stop to consider that, in a sense, we are not actually selling, nor is the customer buying a machine tool." "He is really 'buying a profit,' or, saying it differently, he is 'spending for profit.'" Mr. Hollengreen went on to say that the "cost of not having" is sometimes very high.

Concerning the guaranteed annual wage and automation, Mr. Hollengreen said that there is nothing new about automation except the word itself. Call it mechanization, technical progress, or, just better, faster and

highly improved machine tools, it's all the same thing to NMTBA's proxy. All industrial history shows that employment has always increased in proportion to mechanization. According to Mr. Hollengreen, the most outstanding example of increased employment in relationship to increased mechanization is in the automobile industry itself. He said that he knows of no better example of the American philosophy of providing a good product on a quantity basis within the price range of the largest number of people. This has been made possible only by the utilization of machine tools—in short, by increased mechanization or automation or whatever you want to call it, he said. Further, in order for the machine tool industry to stay alive, it



William E. Rutz, Chairman of the Machine Tool Show Committee, unveiled this display during his talk at the 53rd Spring Meeting of the Association

must show the customers ways and means of producing the products they make, better and more inexpensively than ever before. In other words, according to Mr. Hollengreen, the industry lives by maintaining a factor of "guaranteed annual increase in rate of productivity." Finally, he stated that if the metalworking industry of this country will immediately undertake a sound and comprehensive program of replacement of obsolete machine tools, we can assure them a "guaranteed annual increase in the rate of productivity" with a saving of over a billion dollars a year and with an employment increase.

The Chairman of the Machine Tool Show Committee, William E. Rutz, executive vice-president of Giddings & Lewis Machine Tool Co., gave the NMTBA members a report on the show progress. Mr. Rutz was responsible for the display, pictured herewith, which was unveiled before the membership. One of the things strongly stressed by Mr. Rutz is the job of getting the right kind of people to visit the Show. The members were also informed that a market study will be made in connection with the Show. Quoting from Mr. Rutz: "Here is another important bit of news in connection with our Machine Tool Show. It is an attempt to make the first market survey ever attempted by the machine tool industry."

"To help us make this project a success, we would like to appeal to you to encourage your customers to fill out the registration card carefully, and in detail, as requested. Now, here is what we would like you to do. If you will examine a registration card to be filled in by every visitor, you will note that he is asked his title, the function he performs in his plant, an estimated number of employees in his particular plant which he represents, and the product manufactured there."

"The finished analysis will show the registration of visitors geographically, by size of plants, by products, and by number of employees. This, then, will be compiled in book form and will be known as the Official Register of the Show. This survey, I am sure you will agree, will assist greatly in finding new markets for machine tools and have many other usages, because nowhere else is such information available."

Tell Berna, NMTBA's General Manager, stated that the outstanding projects of the Association are the Machine Tool Show and the work being done in Washington. He also reported on a number of projects in the field of standardization undertaken by

the Association. One of the subjects Mr. Berna discussed was the problem of some machine tools broadcasting a signal at radio frequency. He stated that with the increasing sensitivity of radio reception, particularly in aircraft, interference threatens to become a very serious problem. Every time an electrical contact is made or broken, a signal is broadcast. To make matters more difficult, he went on to say, v-belts and anti-friction bearings may send out messages of objectionable volume. We quote the following passages from Mr. Berna's report on the subject:

"The Navy has attacked this problem by including in its invitations to bid the stipulation that radio suppression must meet the requirements of Specification MIL-L-16910."

"The Interference Reduction Section of the Bureau of Ships acts as technical advisor to all of the Bureaus of the Navy."

According to Mr. Berna, not every machine requires radio suppression. If the transaction involves a machine that is known to be free from interference, the stipulation is not included in the specifications. The Bureau reported that approximately 90 per cent of the machines purchased last year did not require radio interference tests. If the disturbance lasts less than one second and does not occur more than every three minutes, the machine is not subject to the requirement of reduction of interference. When suppression is required, they want the means of radio suppression, such as filters, condensers, etc., built into the equipment, not stuck on later as an afterthought. Grounding the central enclosure, running control and power wires in a grounded, flexible shielded conduit, may suffice. Using a metallic gasket on enclosure doors is advisable, to effectively ground the door to the case.

Everett M. Hicks, Chairman of the NMTBA Government Relations Committee and vice president and general manager of The Norton Co., reported on the various national and international problems of the machine tool builders. Concerning imports of foreign tools, he stated that machines brought in to the U. S. amounted to 2.8 per cent of domestic shipments last year.

Comparing 1954 and 1952 imports in terms of dollars, last year \$23 million worth of tooling was shipped in while in 1952 imported tools amounted to \$48 million.

Mr. Hicks reported some relaxations of import restrictions in some foreign countries. Belgium, Luxembourg, and The Netherlands will now issue import licenses for machine tools

automatically. Germany has eliminated a quota restriction on the imports of American machine tools. Sweden requires no import license, and such licenses are much easier to obtain in Denmark.

On the subject of permanent defense capacity, Mr. Hicks stated that the Government has failed to comply with the Vance Plan which recommended that machine tool production should be kept at a level of from \$800 million to \$1.1 billion per year, with Government purchases running from \$500 million to \$800 million. Machine tool shipments for the first quarter of 1955 were at a rate only slightly above \$600 million per year, which is much below the Vance minimum for the industry.

Commenting on the 'elephant' tool program, Mr. Hicks reported that the Business and Defense Services Administration is conducting a study to determine existing capacity and requirements. A figure of \$45 million has been mentioned as the probable size of the deficiency in general purpose 'elephant' tools, but the NMTBA believes that the survey will disclose a critical need for several times the amount mentioned.

It was brought out that the Navy has inaugurated a replacement program under the direction of the Bureau of Ships. All naval installations have been requested to report on the need for replacement machines. The goal is to be a continual replacement program designed to keep all Naval installations in a state of readiness to meet any and all mobilization requirements.

The following is an abstract of a paper presented before the NMTBA meeting by Louis Polk, First Vice President of the NMTBA and president of Sheffield Corp.

Seventh Decimal Place By Louis Polk, President

SHEFFIELD CORP.

The real opportunities for growth, for greater sales, in the machine tool industry, lie as much in improving the output quality of our machines as increasing their quantity output.

The great selling effort our industry has undertaken for Chicago in September is in part an acknowledgment of that truth. We know new marvels of production will be unveiled at Chicago . . . means for machining and dividing to thousandths, tenths of thousandths, and so on . . . even to the sixth decimal (Turn to page 102, please)

NEW

EQUIPMENT

PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Automatic Controller

AUTOMATIC digital control for use on many types of machine tool operations is provided by a device which can also be used to hold aircraft valves as well as other types within preset limits. It may be used in general industry where automatic controls are required.

Heart of the new controller is a small unit with a count capacity of 2500 counts, which adds and subtracts automatically at rates up to 20 decimal digits per second with an accuracy of 0.04 per cent.

In a typical machine tool operation, this new controller was developed in conjunction with Sheridan-Gray, Inc., to be used on their line of stretch forming machines. A sheet of aluminum is placed in the stretcher, and a small transmitter establishes a digital count as the machine is operated manually from the start to the completion of the metal-forming operation. The transmitter, consisting of a mechanical switch and capacitor, sends pulses to a thyatron in the controller, and the count is noted at the start and stop of the operation. Then for all succeeding operations, the skin stretcher is controlled by these two counts preset by two sets of switches on the controller. The operator of the machine thereafter merely places a piece of aluminum in the stretcher, and at the correct count the controller starts a motor switch for the forming operation. This operation proceeds automatically until the transmitter sends the final count. The controller then automatically stops the motor operating the stretcher.

The controller contains two 50-position stepping switches which are so connected as to permit 50 x 50 or 2500 counts. Counts come into the stepping switches from any pulsing device used as a transmitter. In the applications previously described this could be a mechanical switch, or photocell, transducer or thermocouple. The counts are stored in the count register, and the number is shown on the

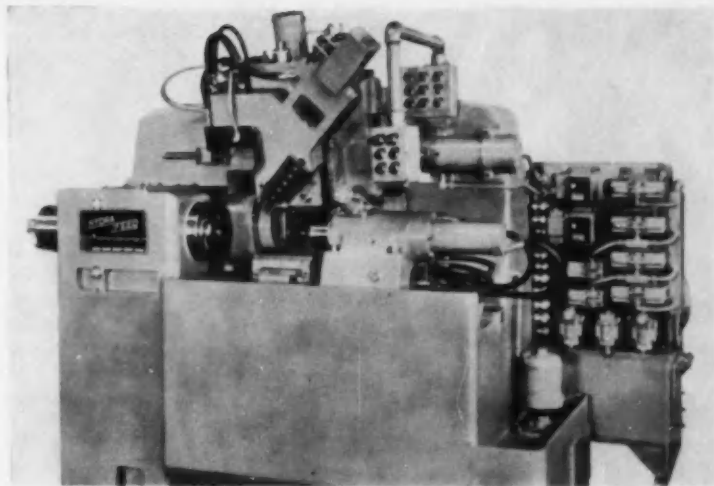
Tracer Slide on Top Carriage

LOCATION of the tracer slide on the top carriage of the recently-announced HD-8 tracer lathe lessens the possibility of chips and dirt, etc., getting onto the slide. The unobstructed front of the machine permits easy loading, unloading and checking of work. Machines can be supplied with either a constant or variable speed drive for the spindle. Also available is an auxiliary rear carriage for facing, grooving, chamfering or any other type of cut that can be handled by a straight plunge operation.

Either flat or round templates can be used, which can be positioned quickly and positively. They can be made of relatively soft material since the light pressure of the stylus reportedly results in no appreciable wear.

Chip flow is unobstructed and automatic chip removal equipment can be installed readily at the large opening provided in the rear of the bed. The machine conforms to JIC hydraulic and electrical standards. — *Hydra-Feed Machine Tool Corp.*

Circle 51 on postcard for more data



Front view of Hydra-Feed HD-8 tracer lathe, shows tracer slide at the top; optional rear carriage is visible at center of machine.

light bank of four Inditron tubes.

One set of switch controls on the front panel of the controller sets up any four-digit number, positive or negative, and is preset by the operator to control the level of one input to the controller; or the level for starting or stopping an operation, making a machine go forward or reverse, etc. When the count stored in the count register, the stepping switches, reaches this preset number from the first input, a signal goes to the grid

of a driver tube which operates a relay and provides an output control signal from the controller. A second similar circuit, completely independent, operates with the second set of preset control switches on the front panel and operates a second relay through a driver when there is coincidence between the input count and the preset number. Thus the controller provides two inputs and two outputs. *American Electronic Mfg., Inc.*

Circle 52 on postcard for more data

NEW EQUIPMENT

PLANT • PRODUCTION

Balances Heavy Parts

HEAVY-DUTY and Diesel engine connecting rods from 7½-in. to 12½-in. center distance can be handled on a balancing machine just announced. A milling machine having two opposed

Then the heads are locked in correct milling position to remove necessary excess material from each end. The fixture feeds forward, first past one set of rough milling cutters and then



Head and fixture movements on the Snyder balancer are hydraulically controlled. Packaged electronic units are used throughout.

double-spindle heads, a console containing all operating controls and a precision weighing unit make up the package.

The rod is first placed on the weighing unit. Part finder fingers on the milling machine are set automatically to within 0.001 in. for removal of the correct amount of balancing stock from lugs provided on the piston and crankshaft ends of the forging. The rod is manually removed and placed in a fixture on the milling machine. Pushing a cycle button in the console then causes the fixture to retract between the milling heads while simultaneously clamping the rod. Both heads then advance until the part finder fingers contact the rod ends.

Reactor-Type Amplifiers

THE P&H power amplifier is a non-rotating source of variable d-c power which provides variable speed, stepless control. Input power can be any phase and voltage combination. It is designed around transformers,

past the second set of finish milling cutters. The weighing operation for another rod is performed during the milling operation.

Two sets of milling cutters are provided to divide the amount of balance stock removal which tends to increase as forging dies wear. The milling cutters are inserted tooth carbide types.

This machine is ideally adapted to the balancing of a wide variety of heavy-duty connecting rods within the center distance capacity. Only a fixture and clamp detail need be changed to mount different rods in the milling fixture. The weighing scale is individually calibrated. *Snyder Tool & Engineering Co.*

Circle 53 on postcard for more data

saturable reactors and rectifiers. Control can be achieved electronically, by a simple rheostat or any other variable arrangement. Standard size of one to 30 hp are offered. *Electrical Products Div., Harnischfeger Corp.*

Circle 54 on postcard for more data



Feedmatic Model 160 rotary hopper.

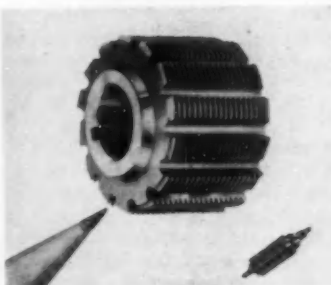
Hopper Feed

A NEW rotary hopper is designed to provide accurate, high-speed parts delivery to presses, grinders, special machines and machine tools, and can also be used for sorting, counting and inspection operations.

The unit operates by means of a fully enclosed, continuous-duty motor, and has a slip clutch for overloads, which is easily accessible for adjustment. Twelve-pitch gears, mounted on ball-bearing shafts, are used throughout for continuous, heavy-duty performance. All gears and bearings operate in an oil bath. The rotary hopper incorporates a three-point mounting in the base, for easy installation on rough or uneven surfaces. The unit itself is fully adjustable to assure best feeding angle. The hopper can be supplied with as many as four separate feeding tracks. *Feedmatic, Inc.*

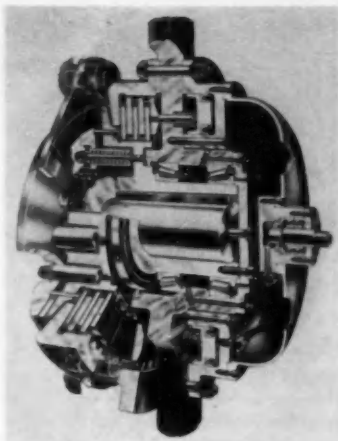
Circle 55 on postcard for more data

Fine Pitch Hobs



A completely redesigned line of fine pitch hobs meet all of the requirements of the revised ASA standards. Illinite hobs are for cutting gears with a diametral pitch of 20 or finer, up to 120; for bore diameter of 0.315, 0.750, and 1.250 in.; pressure angle of 14½ or 20 deg. *(Illinois Tool Works)*

Circle 56 on postcard for more data



Bliss Type M clutch-brake.

Clutch and Brake

TYPE M combination air friction clutch and spring-released brake is designed for crankshaft mounting on new presses or for replacement of old style clutches. It requires one valve for operation and control. It does not have to start and stop backgearing. Cool running operation however, is assured by many built-in ventilation features. Long-lasting, hard linings are provided for maximum wear, and no adjustments are necessary. In addition, these clutches and brakes are equipped with anti-friction roller bearings. *E. W. Bliss Co.*

Circle 57 on postcard for more data

Data Reduction System

PNEUMATIC or electric signals can be converted into tabulated digital records by the Automatic Logger data reduction system. It may be integrated with industrial instrumentation systems currently in use, for automatic control, computing, or process reset with a punch card programmer. It was developed for transition from manual or semi-automatic operation to completely automatic process control. Measurements of pressure, temperature, flow, weight, stress, level, or other variables are automatically recorded in individual vertical columns on the log sheet, so that any variable may be readily scanned for trends. A punched tape with identification digits for each variable is punched simultaneously with the typed log. Readout may occur at hourly, half-hourly, or other preset intervals. The device samples the measured variables continuously and stores the information to be logged at

Automatic Gas Cracking Generator

ONE package comprises all controls, piping and equipment of an endothermic atmosphere generator for heating steel free of carburization or decarburization.

Features of the Hyen Hydriizing Generator include its compactness, ease of operating the controls, ease of cleaning the carburetor, larger catalyst bed and interchangeable ceramic or Inconel retort. It is being built in 500, 750 and 1500 cfh sizes.

The air-gas ratio is set with a graduated adjusting knob on the carburetor. The mixing machine automatically draws the air and raw gas through the flowmeters, and the carburetor holds the desired air-gas ratio constant regardless of the rate of flow or variable atmosphere demand placed on the generator. The air-gas mixture is pumped through the automatic pressure and flow valve, through the automatic fire check and into the catalytic cracking retort. This retort is externally heated to incandescence by means of a fully automatic gas-fired principle. The gen-

erator operates at 2200 F.

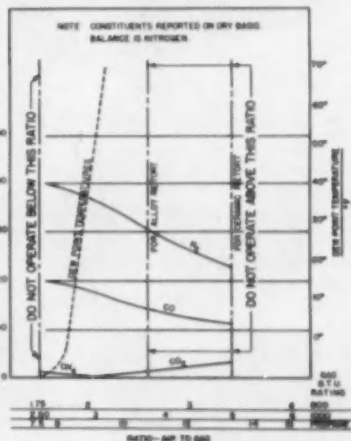
The completely reacted, dry, hot atmosphere can be piped directly to the heat treating furnace or it can be cooled for metering and distribution where more than one furnace is to be supplied.

Operation is fully automatic. The operator merely lights the pilot on the gas burners and presses the push-buttons on the control panel. When the catalytic retort reaches the proper temperature, the mixing machine is started and the protective atmosphere is immediately available for use. The automatic temperature control, mixing control, and pressure and flow control make it possible to cut a furnace into the atmosphere line or to cut it out without the necessity of the operator returning to the generator to readjust the air-gas ratio, the pressure, or the flow. He merely opens the valve at the furnace until the flowmeter on the furnace indicates the proper flow. *Lindberg Engineering Co.*

Circle 58 on postcard for more data



The Lindberg Hyen endothermic generator, and approximate analysis of the atmosphere.



the subsequent readout period. Thus, readout may be accumulated total of the variable, or the average over the time cycle. Measurement of the variables may be made at the same instant of time, even though recording of data occurs sequentially over an extended period. *Fischer & Porter Co.*

Circle 59 on postcard for more data

Automatic Dumpers

THE Flow-mation system consists of work station hopper racks and sliding door boxes that automatically open and discharge their contents. The line includes a single-station unit

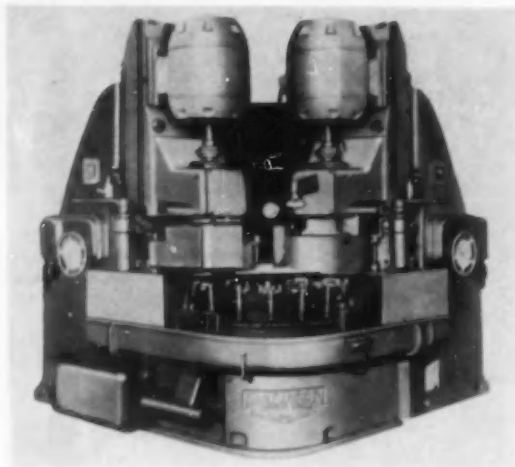
that contains both the box holding the pieces requiring work, and the receiving box in the same rack.

The basic unit consists of a box with a guillotine type door and a portable hopper stand. When the fork lift operator places the box on the stand it automatically lifts the guillotine door discharging the contents into a large capacity hopper.

Other units include a hopper box with stand, a double size hopper box, and roll-overs and funnel boxes compatible to the system. *Powell Pressed Steel Co.*

Circle 60 on postcard for more data

Grinder for Processing Connecting Rods



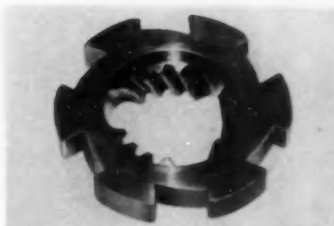
Mattison production automatic-sizing grinder for heavy connecting rods.

AN AUTOMATIC double-spindle, single-pass, rotary table grinding machine has been built for processing large truck engine connecting rods. Mechanical clamping and unclamping devices operate automatically as each work holding fixture rotates past actuating cams bracketing the loading station. Rough forgings are finished in one pass under the wheels. One wheel grinds the crank ends, the other the pin ends. Stock removal is 0.008 in. on each side.

Automatic down-feed—actuated by sizer-gages which constantly check dimension being machined at each wheel head—compensates for wheel wear and permits uninterrupted production with only spot-checking of parts for size. Step between two ends of the rods is held within 0.001 in.

Wheels are self-dressing. Production rate for two operations on two sides is 400 rods per hour.—*Mattison Machine Works.*

Circle 61 on postcard for more data



Stationary gear plate showing the internally broached involute splines and grooves.

Spiral Grooves Broached

Two different types of spiral grooves—one an involute spline—are being broached simultaneously in the same internal diameter of a transmission part. Four stationary gear plates are broached during one single stroke of a pull-up machine, Model RU 20-66 (SP). Production is 480 parts per hour, at a cutting speed of 15 fpm.

During the 60-in. broaching stroke, the I. D.'s of four gear plates are broached to a 1.389-in. diameter, and nine involute (18 index) internal spiral splines and three internal helical grooves are cut. The four-station fixture is equipped with four vertical loading tubes and an automatic shuttling device with a 10½-in. stroke that receives parts from the loading tubes and locates them in position for broaching. Broaches are drawn through the parts in a spiraling motion produced by helical lead bars attached to each broach puller.

After the shuttle fixture is retracted, completed parts drop onto a hinged baffle that directs them into an unloading chute. Broaches are then retracted, and the 30-second cycle is automatically repeated. *Colonial Broach Co.*

Circle 62 on postcard for more data

Grinds Threads on Long Rods

LARGE thread grinders are now being used to grind ball race screws and other long rods for aircraft actuators and machine tool lead screws. The style 120 precision thread grinder will grind 10 ft of thread length in one setting, and will accommodate work up to 12 ft long between centers. Longer workpieces can be inserted through the work spindle, and longer threads can be ground a section at a time, or by turning the work end for end. The lead at adjacent sections can be continued accurately.

Automatic features include feed to finish size, grinding wheel dressing, resumption of the grinding cycle after

dressing, backlash compensation, control of coolant flow, lubrication and retracting the grinding wheel at the end of the grinding cycle. The work

table is fully supported on anti-friction rollers the full distance of its travel. *Ex-Cell-O Corp.*

Circle 63 on postcard for more data



The Ex-Cell-O large thread grinder, style 120.



Five-hp type DP Wagner motor, 215 frame.

New Motor Line

GENERAL-PURPOSE ball bearing poly-phase motors, type DP, in re-rated NEMA frame sizes 182 through 326 are announced.

They feature corrosion-resistant cast iron frames suitable for indoor or outdoor use. Frames are smoothly contoured so that moisture cannot collect on their surfaces and construction is so completely dripproof that the motors are said to be suitable for many applications formerly requiring splash-proof motors.

To protect the motors from moisture, ventilating air intakes are located at the bottom of the endplates and air outlets are positioned at the base of the frames on each side. Specially formed baffle plates direct air into the blowers and through the motor and also provide extra protection for the stator windings.

Type DP motors will be available in one to 30-hp ratings, three-phase, 60-c, 1750 rpm. *Wagner Electric Corp.*

Circle 64 on postcard for more data

Scans Processes

AN electronic indicating scanner makes it possible to test and control continuously an unlimited number of industrial processes from a single vantage point. The instrument monitors a variety of process variables involving level, temperature, thickness, mechanical movements, tolerances, weight and pressure. It will keep a steady check on six, 12, 24, 48 and more steps in a manufacturing process, the company said.

The speed of scanning depends largely upon the number of points to be checked, with a maximum rate of one point per second. Where there is a process that strays beyond the preset control zone the scanning stops at that point and actuates an alarm or flashes a signal. The indicator dial shows the extent of the deviation. As-

No. 0 Centerless Grinding Machine

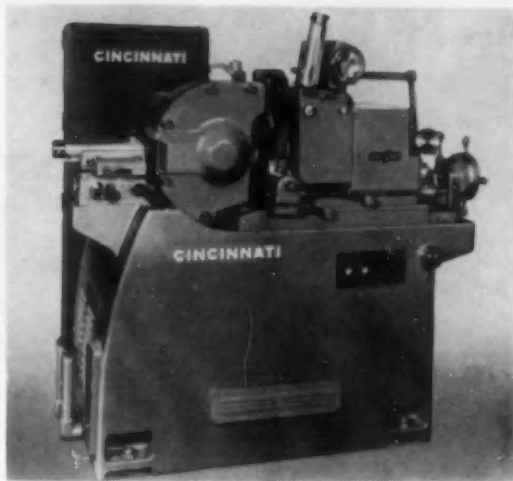
DESIGNED for metallic and non-metallic parts ranging up to ½ in. in diameter, a small sized No. 0 centerless grinder is claimed to be a low-cost producer of small shafts, drills, pins, and similar parts. The grinding wheel spindle is mounted in a Filmatic spindle bearing, a multiple segment bearing which supports the spindle accurately and rigidly on high pressure, wedge shaped films of oil. The bearings are self adjusting for heavy roughing cuts or light finishing cuts and are said to require no maintenance for the service life of the machine. Spindle lubrication is automatic, and an automatic cut-out is provided to stop the spindle driving motor if lubricant pressure should fail. Spindle bearings are rigidly mounted in the bed casting.

The regulating wheel unit is carried on the base in two wide dovetail slides to permit adjustment of the workrest in relation to the regulating wheel, and adjustment of both workrest and regulating wheel in relation to the grinding wheel. A swivel plate

is located between the lower slide and the base to permit correction of slight errors in straightness without having to retrue the wheels.

The standard diamond truing attachment is hydraulically actuated and trues the wheel to a straight cylindrical shape and to slight tapers if desired. A profile hydraulic truing attachment is available. The standard regulating wheel truing attachment is of the straight screw-type although a profile screw-type, a straight hydraulic type, and a profile hydraulic type are available. Grinding wheels are 16-in. maximum diameter with 10-in. diameter hole and maximum width of four in. They are mounted in separate wheel mounts with four adjustable balance weights. Regulating wheels are nine-in. maximum diameter with four-in. diameter hole and maximum width of four in. They mount directly on the end of the regulating wheel spindle; no wheel mount is required. *Cincinnati Grinders Incorporated.*

Circle 65 on postcard for more data



On the Cincinnati No. 0, a separate cutting fluid tank of 40 gallon capacity and an individually motor driven cutting fluid pump of 21 gpm capacity are located at the rear of the machine and are provided as standard equipment.

sociated control systems may automatically correct the condition. *Fielden Instrument Div., Robertshaw-Fulton Controls Co.*

Circle 66 on postcard for more data

Pickling Hooks

MONEL hooks for use in pickling operations, of all-welded construction, feature a specially-designed drip trough on the load bar that picks up condensate and carries it out beyond the rod bundles. These hairpin-

type hooks are available in two types and six standard sizes. Hooks of I-section construction are supplied for applications involving maximum loads up to 3000 lb. Hooks of box-section construction are furnished for loads up to 6000 lb and higher. Length of load-supporting section will vary with the size and number of rod bundles. Standard hooks are bolted to steel spreader bars which can be replaced quickly. *Lewis Welding & Engineering Corp.*

Circle 67 on postcard for more data

NEW

EQUIPMENT

PLANT · PRODUCTION

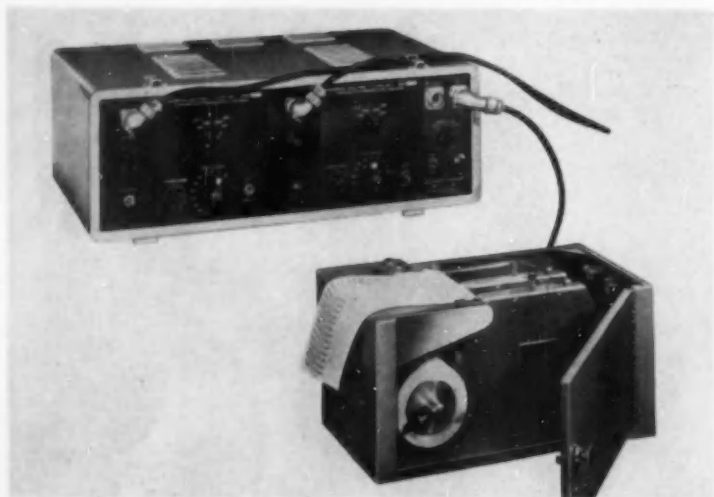


Oscillograph Is Portable

A DIRECT-WRITING oscillograph, the type P Portable Dynograph, is now in production. It is housed in two carrying cases, and can be set up for use quickly. The manufacturer states that this high speed oscillograph recorder provides stable d-c or a-c amplification. It may be used with reluctance type gages without auxiliary equipment. This stability, sensitivity, and versatility are made possible by the company's chopper amplifier. Performance specifications of the type P are 15 microvolts d-c per millimeter

of pen deflection, with a response time of less than 1/120th second. There is said to be no zero drift. The pen excursion is over eight cm. The high torque pen movement is designed to provide accurate frequency response at high and low amplitudes, and eliminate hysteresis by completely overpowering pen friction, even with the chart stationary. The type P is supplied with one or two channels. A console model, type M, is available for up to six channels. *Offner Electronics.*

Circle 68 on postcard for more data



Portable Dynograph is designed for recording such transient variables as strain, vibration, temperature and analog computer write-out.

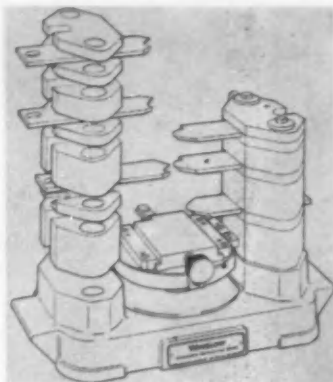
Hose Assembly Machine

FOR rapid make-up of Hoze-lok fitted hydraulic hoses, the model 332 hose assembly machine is being offered. By means of a power-driven spindle, the fitting socket is turned onto the hose and similarly the nipple is screwed into the socket. A jog switch gives the operator control of the speed when assembling the fitting onto the hose. The motor is reversible. A wrenchless chucking device speeds the clamping of the fitting parts. The mandrel attachment, for the different inside diameter sizes of

hoses, eliminates danger of scoring the hose inner liner.

The carriage vise, which the operator moves up by means of a handle, grips either the hose or the socket. The machine handles fittings of sizes 3/16 through 1 1/2 in., for medium pressure type SAE 100R5 cotton covered single wire braid hose and type SAE 100R1 rubber covered single wire braid hose, and high pressure type SAE 100R2 rubber covered double wire braid hose. *Tube & Hose Fitting Div., The Parker Appliance Co.*

Circle 69 on postcard for more data



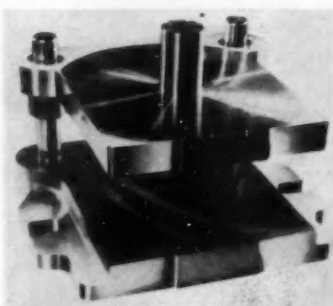
Exploded drawing of Winslow guillotine gage.

Guillotine Gage

PRECISION-BUILT stock components give versatility to guillotine gages for airfoil inspection of jet engine blades. Advantages listed by the manufacturer include quick delivery, lower original cost and lower maintenance, less gage down-time and an end to gage obsolescence. The gage checks both the forging and the finished part by merely substituting a different holding fixture. It can check up to 10 different features of a blade and, if originally furnished to check only part of the list, can easily be converted at a later date to check additional features. *Winslow Manufacturing Co.*

Circle 70 on postcard for more data

Die Set Line



Outstanding features of standard die sets produced in accordance with recently established ASA standards include an oil lubrication system and grinding of top and bottom outer surfaces. Hundreds of thousands of different sizes and shapes of standard die sets can be assembled from local stocks of standard components. This unique system is designed to allow faster delivery of die sets which would otherwise have to be produced to meet individual requirements. *(Danly Machine Specialties, Inc.)*

Circle 71 on postcard for more data

Materials and Processes: Alloy, Coolant, Plastic, Textile

High Nickel Alloy

A versatile high nickel alloy is capable of resisting corrosive attack in a large number of hot acids and mixtures of acids. Called Nionel, it has a nickel content of approximately 40 per cent. It also has about 21 per cent chromium, 3 per cent molybdenum, 1.75 per cent copper, 31 per cent iron and small amounts of manganese, silicon and carbon. The relatively high nickel content plus molybdenum and copper make the alloy considerably more resistant to hot sulfuric, sulfurous, and phosphoric acid solutions than any of the common stainless steels. The chromium content is sufficient so that when fortified with nickel, the alloy resists a wide variety of oxidizing chemicals.

Nionel is a tough, strong weldable alloy with mechanical properties on the same order as those of Inconel. It is produced in all standard mill forms including plate, rod, seamless condenser tubing, pipe and extruded tubing. *The International Nickel Co.*

Circle 72 on postcard for more data

Neoprene Tarpaulin

Nylo-Tarp is a combination nylon and neoprene tarpaulin material that combines high strength with resistance to weather and abrasion. It is said to be lighter than conventional materials. *Haartz-Mason, Inc.*

Circle 73 on postcard for more data

Seals Porous Metals

The Kemi-Seal process of filling the pores of cast iron, alloys and non-ferrous metals can be carried out in several ways—varying from a hand operation to a set-up handling hundreds or thousands of parts per day. The material is a silicated compound containing oxides and pigments which permanently seal the pores and small leaks. It may be thinned with water. It is impregnated under pressure at a temperature of 160-180 F, which is accomplished by circulating the sealing solution through the parts. *Wayne Chemical Products Co.*

Circle 74 on postcard for more data

Coolant for Aluminum

A stain-free coolant for cutting and grinding aluminum is reported to have a high degree of lubricity and detergency, has anti-weld properties that prevents welding of chips and dust to tools and wheels. It mixes easily with

water to form a stable emulsion. Designated compound 131-A, it will not discolor aluminum alloys, and reportedly produces a superior finish, both in appearance and profilometer readings. It does not react with aluminum dust. *International Chemical Co.*

Circle 75 on postcard for more data

Cast Acrylic Sheets

Full production of C04 Acrylic, optically clear cast rigid sheets, is now under way. It is available in thicknesses of 0.020 to one in. and sheet sizes for a wide variety of industrial, manufacturing, commercial and merchandising uses. All sheets are supplied completely masked when shipped. The maker says it specializes in producing and fabricating the material to closer tolerances than have heretofore been available. *Cast Optics Corp.*

Circle 76 on postcard for more data

Porous Silver Bearings

A porous silver for use as a bearing liner is made using sintered wire and can be made to carry bearing loads as high as 50 to 75 per cent of those of solid silver. Void content can be in the range 10 to 50 per cent, as desired. Impregnation with various lubricants can readily be accomplished. *Micro Metallic Corp.*

Circle 77 on postcard for more data

Paint Stripper

Octastrip 31 has been tested in use over a year to strip paint, varnish, epoxies and most organic coatings. It is non-flammable, used cold and rinsed with water. It is used in a dip tank and a water seal is added. The maker formulates special strippers to fit problems not solved by its line of over 20 strippers. *Octagon Process, Inc.*

Circle 78 on postcard for more data

Reinforced Molding Plastic

A fully-loaded glass-modified material offering strength and ease of molding is generally available. Two glass-and-cellulose materials, designated RM 4015 and RM 4030, are designed for heavy duty industrial applications. They offer tensile and flexural strengths of 19-22,000 psi and 33-38,000 psi, a bulk factor of two to one, fast rate of cure, moldability, and long shelf life. They are offered as sheets or blanked pre-forms. *Rogers Corp.*

Circle 79 on postcard for more data

Freeze-Hardening Stainless Steel

AM-350 chromium-nickel-molybdenum stainless steel was developed to be hardened by freezing, a new departure in heat treatment practice. It has properties similar to 300-series austenitic stainless steels but can be hardened by heat treatment. The mechanism is similar to that in hardening 400-series hardenable steels. Annealed and sub-zero cooled tensile strengths are respectively 163,700 and 200,000 psi, with hardnesses of 93 Rb and 43 Rc. *Allegheny Ludlum Steel Corp.*

Circle 80 on postcard for more data

Denser Foaming Plastic

Conform 114 is a liquid phenolic resin for structural core applications. It provides 50 per cent more strength than the maker's previous formula—compressive strengths of 37 psi for three-lb density to 1100 psi for 21-lb density. It will foam at room temperature, to be formed into large masses without heat or pressure to produce a hard honeycomb type material. *Rezolin, Inc.*

Circle 81 on postcard for more data

Magnesium - Thorium Alloy

One metals supplier is now rolling magnesium-thorium alloy HK31 sheet and plate. The thorium alloys of magnesium were formerly available only as castings. These alloys have excellent tensile strength and creep resistant properties in the 300 to 700 F. *Brooks and Perkins, Inc.*

Circle 82 on postcard for more data

Textile Backing

Application of an odorless synthetic rubber latex coating to the back of textiles has been developed by Burlington Decorative Fabrics, Burlington Industries, Inc., on Pliolite latex. The new latex treatment strengthens fabrics in all directions and gives them ability to retain shape, even after severe stretching. Barely visible, the latex coating adds durability and improves fabric drape and body. Binding the individual fibers in place, it reduces ravelling and improves tear and snag resistance, even in loosely woven textiles. The new coating is light in weight yet gives adequate strength without destroying flexibility. *Goodyear Tire & Rubber Co., Chemical Div.*

Circle 83 on postcard for more data

NEW

PRODUCTS.

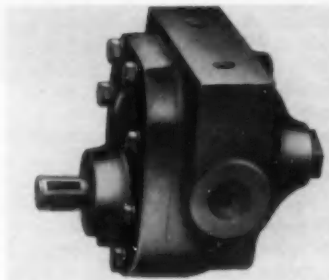
FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Line of Hydraulic Gear Pumps

A line of low-cost standard industrial hydraulic pumps is available for use on lift trucks, tractor front end loaders, road graders and associated equipment. Standardized parts and a single body casting are used. They feature the maker's "pressure loading" of bearings for volumetric efficiencies up to 97 per cent. Fluid pressure from the outlet side is exerted on the pump bearings to main-

tain the end clearance between gear and bearing faces at a thin film of oil. Three different capacities are available, rated at 10, 12 and 16 gpm at 2000 rpm. Each may be equipped for base, round flange or magnet flange mounting. All feature keyed shaft, side ports and assembly for rotation in either direction. *Pesco Products Div., Borg-Warner Corp.*

Circle 26 on postcard for more data

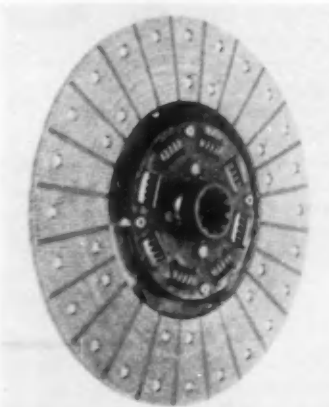


Clutch Dampener Has Flexible Center

Designed to lengthen the life of other drive line components, a clutch spring dampener just introduced features a flexible center. The dampener not only absorbs torsional vibrations but also cushions the amount of torque shock transmitted to the drive line whenever the clutch is engaged. Construction consists of a flanged hub retaining eight compression springs. These are reacted upon by a driven disk with facings and a retainer plate assembly. The springs are assembled in the hub flange openings and protrude into openings in

the driven disk and retainer plate. A flexing action thus takes place within the assembly when transmitting torque. The flexibility when absorbing torque shock loads and torsional vibration is dampened by two friction disks under spring tension placed between the hub flange and both the driven disk and retainer plate. The new dampener is primarily for use with DP (direct pressure) clutches for heavy-duty vehicles. It is available for 10 $\frac{1}{2}$, 11, 11 $\frac{1}{2}$, and 13-in. clutches. *Lipe-Rollway Corp.*

Circle 27 on postcard for more data



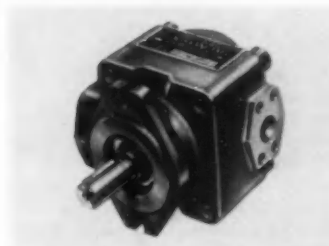
Dual Vane Pump for Vehicles

A dual vane hydraulic pump, Series PFM-100, is designed for high speed direct engine drive. Built to withstand continuous operation at 2000 psi, the new pump has a rated capacity of three to 11 gpm at 1200 rpm, but may be operated at speeds from 400 up to maximums of 2000 to 2600 depending upon pump size. All standard SAE and industrial mountings

and piping provisions are available, offering flexibility of port positions.

The patented dual vane construction provides multiple fluid seals which reduce slippage and power loss to the absolute minimum. Excessive loads are eliminated by the complete hydraulic balance of all internal parts. *New York Air Brake Co.*

Circle 28 on postcard for more data



Foam Padding

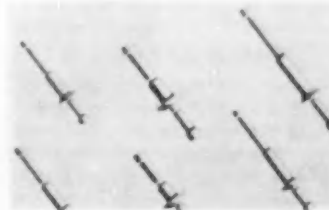
Bond-Foam seat cushion padding recently announced to the trade is made of latex bonded virgin foam rubber. It is offered in sheets from $\frac{1}{4}$ to four in. thick as well as in several stock mold patterns. *Adaco Molded Products Co.*

Circle 29 on postcard for more data

Blind Rivets

Commercial blind rivets similar to aircraft-type fasteners are now being offered to industry generally. It is set by a special gun which pulls the stem into the hollow shank, upsets the head on the blind side and fills the hole in the work. *Towaxend Co.*

Circle 30 on postcard for more data



Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Instruments

Educational Bulletin No. 9 is available to those interested in the application of automatic control equipment to the solution of industrial process control problems. It discusses conventional millivoltmeter construction and its application to a control instrument. Also described is the function of an oscillator circuit in a pyrometer controller, along with various control forms which can be developed from this type circuit. *Wheelco Instruments Div., Barber-Colman Co.*

Air Cylinder Data

Bulletin A-105K gives design, construction, engineering and mounting and dimensional data on 200-psi heavy duty air cylinders from 1½ in. through 14 in. bores in strokes up through 22 ft and 17 standard mounting styles. *Miller Fluid Power Co.*

Constant Speed Drives

Operation of ball piston hydraulic constant speed drives is detailed in bulletin GET-2480, including operating characteristics and functions of the drives and line drawings and schematic diagrams of drive operations and components. *Aeronautic & Ordnance Systems Div., General Electric Co.*

Stampings, Moldings

Details of its stamping and molding service as well as its line of die cushions, trimmers and other press items are given in a new booklet from *Dayton Rogers Mfg. Co.*

Fiber Plastic

"Engineering Materials For Modern Industry" is the title of a 16-page bulletin just published, covering the properties, grades and case studies of uses of vulcanized fiber and laminated plastic. *National Vulcanized Fibre Co.*

Pickling

"Equipping the Pickle House," is offered as a practical guide to greater production at lower cost in a wide variety of pickling operations. The 32-page booklet describes the use of specially designed Monel equipment in the processing of large and small fabricated parts, hollow ware, and forgings and castings, as well as the common mill forms of steel and tin plate. *International Nickel Co., Inc.*

Diesels

Features of their Type "S" and "SS" heavy duty Diesel engines in sizes from 375 to 1000 hp are illustrated in a 20-page bulletin, Form 10,040. *Ingersoll-Rand.*

Furnaces

New sizes, holding capacities, and BTU inputs for the soft metal reverberatory furnace of the dry hearth type have just been incorporated into a bulletin C-80. It also describes the hydraulic nose pour type, now available in addition to the standard dip-out models. *Eclipse Fuel Engineering Co.*

(Please turn page)

6/1/55 VOID After August 1, 1955

Circle code numbers below for Free Literature, New Plant Equipment or New Product Information

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Permit No. 36

(Sec. 34.9 P.L.S.R.)

New York, N. Y.

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Village Station,
New York 14, N. Y.

Readers Service Dept.

Rivet Catalog

9

Latest edition of the firm's catalog of high-strength rivets, bolts and driving accessories is now available. *Hi-Shear Rivet Tool Co.*

Vulcanized Fiber

10

Technical information and specifications for various forms and grades of vulcanized fiber are provided in catalog DVF-55. Forms include sheets, rolls, tubes, rods, track rails, and custom fabricated formed or machined shapes. *Continental-Diamond Fibre Co.*

Tooling Plastics

11

An outline of its various Epocast tooling resins is provided in a folder issued by *Furane Plastics, Inc.*

Magnesium Services

12

Facilities and services for the working of magnesium and titanium, also commercial products produced by the firm are illustrated in a folder. *Brooks & Perkins, Inc.*

Specialty Aluminum

13

A distributor for Reynolds Metals announces a catalog covering 1000 different aircraft extrusions, sheet and plate, and wire, rod, and bar. Prices included. *Pioneer Aluminum Supply Co.*

Stainless Brazing

14

A four-page catalog describing the properties and showing applications of Microbraz stainless steel brazing alloy is now available from *Stainless Processing Div., Wall Colmonoy Corp.*

Heat Treating

15

"The Homocarb Method with Microcarb Atmosphere Control for Heat Treatment of Steel," has just been issued. It tells how these furnaces are being used for case carburizing, carbon restoration, homogeneous carburizing and hardening of steel products on a reproducible, mass-production basis. *Leeds & Northrup Co.*

Die Springs

16

The company's complete line of medium pressure, medium-high pressure and high pressure die springs are included in a 16-page catalog which also shows a simplified method of spring selection. *Danly Machine Specialties, Inc.*

Air Tools

17

Case histories showing some answers to reducing fastening costs are part of 50-page Air Impactool catalog 5200-A, which also contains the complete line of air tools, universal electric Impactools, multicycle electric tools and other products. *Ingersoll-Rand Co.*

Blowers

18

The versatility of application for rotary blowers, including information describing new jet engine starting equipment, newly developed tandem blowers and motorized blowers, are features of bulletin 255. *Miehle-Dexter Supercharger Div., Dexter Folder Co.*

List of Hobs

19

A 56-page booklet, revised to April, 1955, lists hobs, cutters, and broaches assembled in producing custom built and production gears for over 30 years. *Brad Foote Gear Works, Inc.*

Motor Buying

20

A 28-page catalog, GEC-1026, of buying information on a-c motors is available from the *General Electric Co.*

Vibration

21

Technical Bulletin No. 706 provides complete data on Temproof mountings for vibration isolation, over the range from -80 F to 250 F. These mountings are extensively used on airborne electronic equipment and also assure excellent vibration isolation for stationary industrial equipment. *Lord Manufacturing Co.*

Torquing Data

22

Manufacturers' recommended torque specifications for cylinder heads, bearings, manifolds and spark plugs are collected in a handbook offered by *P. A. Sturtevant Co.*

AUTOMOTIVE INDUSTRIES

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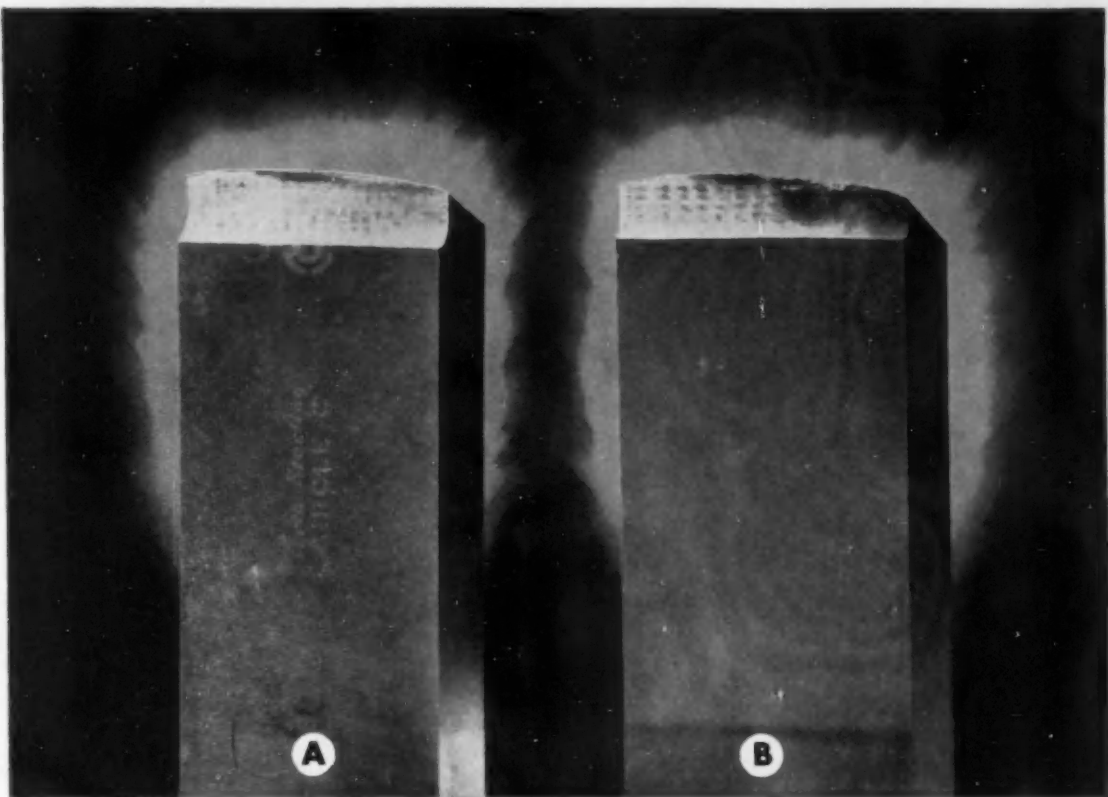
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which tool cut leaded steel?

● Right! The answer could only be Tool A which was used on leaded Aristoloy—4140. Tool B was used on non-leaded Aristoloy 4140 under the same conditions.

A comparison of the cutting edges of both tools demonstrates how the freer machining characteristics of leaded steels increase tool life and thereby reduce machining costs. The lead addition acts as a lubricant reducing friction between chip and tool. Tools therefore operate at lower temperature, contribute to better chip formation and eliminate damaging tool edge build-up.

Why not find out what advantages leaded steel can offer you? Call your nearest Copperweld office today for complete information or write us direct.

SEND FOR FREE CATALOG

If you would like specific information about application of lead steel to your product get in touch with your nearest Copperweld office or write us today.



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Toronto, Ontario, Canada
Monadnock Building
San Francisco 5, Calif.
325 W. 17th Street
Los Angeles 15, Calif.
First National Bank Bldg.
Jamestown, New York
1578 Union Commerce Bldg.
Cleveland, Ohio
3675 Elston Avenue
Chicago 30, Illinois
1807 Elmwood Avenue
Buffalo, New York
7251 General Motors Bldg.
Detroit, Michigan
143 Washington Avenue
Albany, New York
611 Beury Building
Philadelphia 40, Penna.
625 James Street
Syracuse, New York
3102 Smith Tower
Seattle, Washington

NEW

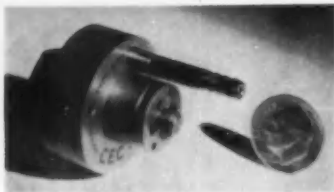


AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Pickup

A new low-pressure pickup not adversely affected by outside vibrations prevalent in such applications as aircraft flight tests, automotive engine tests, and windtunnel measurements has recently been released. Type 4-315 pickup has low acceleration sen-



sitivity as a result of the extremely low mass of the "star" sensing element. It is available in standard ranges of ± 1 , ± 2 , ± 3 psi differential.

It is constructed of Type 416 Stainless Steel and measures approximately $1\frac{1}{4}$ inches in diameter at the diaphragm and $1\frac{1}{2}$ inches in length. Consolidated Engineering Corp.

Circle 36 on postcard for more data

Actuator Motor

The company is now in production on a small actuator motor measuring 1.795 in. O.D. by 2.9/16 in. long. Designed for Douglas Aircraft Co., El Segundo Div., this motor has been approved after passing the environmental qualification test and is now incorporated in the A4D Skyhawk. The motor operates on 400-c current. It is excited with 115 v on the fixed phase and 24 v on the control phase. Torque at stall is 2.9 in.-oz with a power factor at stall torque of 50 per cent. No load speed is 5100 rpm. Temperature range: -55°C to 90°C . Weight is 13.7 oz. American Electronic Mfg., Inc.

Circle 37 on postcard for more data

Checks Plugs

An instrument that will reveal the condition of aircraft spark plugs is now available for commercial use. It will: test insulators of both jet igniter and reciprocating engine



Business Aircraft Heating Equipment

Business aircraft heating design is simplified with the establishment of a complete line of spark-spray and vapor type heaters and accessories. Pictured from left to right are the S-200, 200,000 BTU/hr unit for transport-size aircraft; the V-25, 25,000 BTU/hr vapor type for equipment or compartment heating; the S-50, 50,000

BTU/hr; the S-25, 25,000 BTU/hr for comfort heating; and the S-100, 100,000 BTU/hr unit. In the foreground are an ignition lead assembly, ignition unit, fuel "train," sealed fuel control assembly, and axial flow blower-motor. Janitrol Aircraft-Automotive Div., Surface Combustion Corp.

Circle 38 on postcard for more data

plugs; detect insulator cracks, flaws and other imperfections; determine whether an insulator will withstand an electrical potential in excess of 20,000 v without rupturing or breaking.

A unique feature of the insulator tester is an oil quench in the gap area. It prevents high voltage discharge across the gap, thus revealing any imperfection of the insulator tip. AC Spark Plug Div., General Motors Corp.

Circle 39 on postcard for more data

Titanium Shear Bolt

Hi-Ti titanium shear bolts have been successfully produced, as a companion to the light-metal tension bolts

announced earlier (see AI, April 15, page 94).

The new bolts in some sizes have as high a tension fatigue strength as high-strength steel and titanium tension bolts. They reportedly have more than five times the endurance strength, pound for pound, of a comparable steel bolt in the $\frac{1}{4}$ in. size. Endurance strength of the $\frac{1}{2}$ -in. size tested at $1\frac{1}{4}$ times that of the steel bolt on the same strength-weight basis. Shear strength of the $\frac{1}{4}$ -in. bolt tested 109,200 psi; that of the $\frac{1}{2}$ -in. bolt reached 112,200 psi. The bolts have a surface finish of eight microinches or less, and a head fillet with only 0.015 in. radius. Standard Pressed Steel Co.

Circle 40 on postcard for more data



1953

STERLING introduced a new, amazing piston

1954

ONE car manufacturer selected the new piston

1955

7 Manufacturers specify **STERLING CONFORMATIC*** PISTONS

In 1956... there will be more! This quick acceptance by automotive engineers is a result of the demonstrable superiority of Sterling Conformatic Pistons. Sterling Engineers will be glad to show you how Conformatic Pistons can improve your engine's performance. Conformatic eliminates cold slap, scuffing and frictional power losses... because it conforms exactly to the cylinder walls over the entire operating range. Your Sterling Engineer can give you complete details and arrange a test.

Now LOW-COST
RING LAND PROTECTION
in Sterling CONFORMATIC Pistons

Ring grooves lined with lightweight intra-cast steel inserts give Sterling Conformatic Pistons even longer life... greater efficiency. An optional feature for truck and passenger car pistons.



STERLING ALUMINUM PRODUCTS INC.
ST. LOUIS, MISSOURI

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METALS

Buying Against a Possible Rise in Prices Is Only One of the Reasons Back of the Insistent Demand for Steel

By W. F. Boericke

Steel Industry Operating Practically at Capacity

Steel production appears certain to establish a new record for the industry in the first half of 1955. It may ring up an equally impressive record in the second half if the National economy is not crippled by strikes.

By the middle of May ingot production was reported at 2,334,000 tons per week, or 96.7 per cent of capacity. For practical purposes this is the limit for economical operations and it's unlikely the rate will be increased short of emergency. It's equivalent to 120 million tons of raw steel a year. The remaining 5.5 million tons of capacity represent standby, high cost equipment, too costly to operate normally.

Backlogs of orders are still growing at the mills while deliveries lag. Instead of tapering off as was expected, orders from Detroit call for more steel. In early May the automobile industry took 25 per cent of all steel shipments, against a normal 20 per cent. Orders are being placed with the mills for August and September deliveries. Hard pressed consumers have not hesitated to pay warehouse prices for fill-in tonnages and some have had to go to the gray market or make conversion deals.

The insistent demand is only partly explained by hedge buying against a possible rise in steel prices when labor negotiations are concluded, or by efforts to rebuild inventories, although both are having their effect on the market. Most of the steel is being immediately consumed. While formerly cold rolled flat sheets had the spotlight, now demand has arisen for practically all steel products. The railroads, until recently laggards among steel buyers, have come back into the market in a substantial way.

Higher Steel Prices Anticipated

Most steel men believe that labor negotiations will be peacefully concluded without work interruption. It's acknowledged that labor is in the best bargaining position it has occupied for years. A wage increase is regarded as inevitable—the only question is how much? In 1954, wages were boosted 5 cents an hour, plus fringe benefits. Perhaps double this amount may satisfy the union leaders this year.

But one thing is nearly certain—any wage increase granted will be passed along to consumers in higher prices for steel. *Iron Age* is quoted as predicting at least a \$4 per ton average price increase if the wage

raise follows the pattern. Some steel executives anticipate a higher price—about 60 cents per ton for each 1 cent wage increase. And at least one executive expects a price boost even without a wage increase.

Scrap Prices Lower

The only sour note in the steel situation has been the decline in the price of scrap, which fell to \$34.67 per ton for No. 1 scrap by the middle of May. This represents a decline of about \$3 per ton in a period when steel demand was never higher. Scrap appears to be in ample supply. Trade observers point out that the mills have been using more home scrap and have increased their use of iron in openhearth furnaces which lessens their need to buy scrap on the outside. While the price of scrap used to be a fairly reliable barometer for steel demand, it has less significance today. Warm weather has its usual effect in increasing collections.

Larger Nickel Supplies

The outlook has improved for larger nickel supplies although the metal is still scarce and a gray market has developed. Some stainless steel manufacturers have paid as much as \$1.25-\$1.40 per lb, about double the posted price of 64½ cents. Exports of impure nickel scrap have been tightened by the Department of Commerce and pure nickel scrap cannot be considered for export.

However, the Office of Defense Mobilization is expected to make an additional 2 million lb of nickel available to industrial users during June to alleviate a shortage. This would bring the total to 7 million lb of Government nickel they were scheduled to get in the first half of 1955.

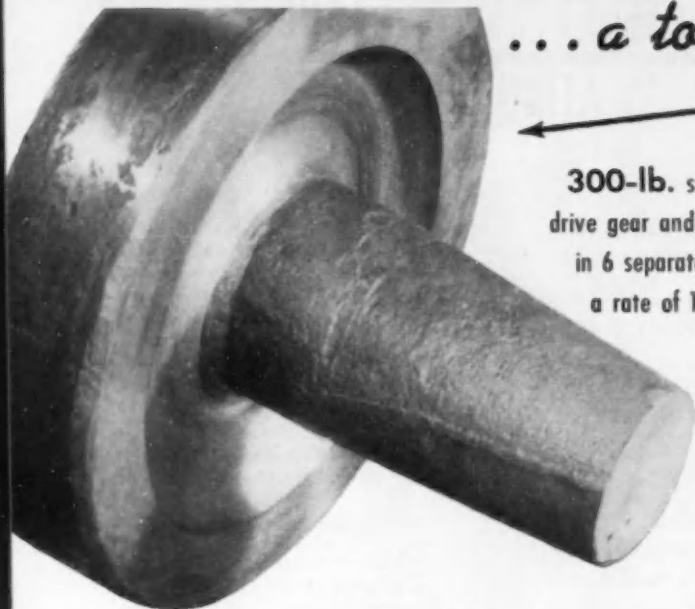
Larger production is expected from Canada as a new nickel-copper mine joins ranks with the two established producers. Stockpiling and defense purposes have taken 40 per cent of the nickel supply but they will probably need less in the future. Manufacturers who have tried to cut out nickel in new design plans, fearing that larger supplies would be long delayed, are relieved.

Aggressive Aluminum

Aluminum production continues to climb to new highs. Aluminum sheets have made great inroads into markets formerly held by galvanized sheets but galvanizers assert that the new and superior continuous
(Turn to page 102, please)

here's A JOB

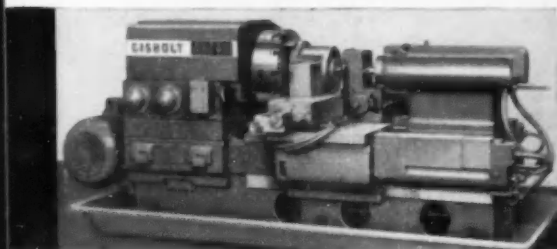
... a tough one!



300-lb. steel forging for final
drive gear and shaft—machined
in 6 separate operations—at
a rate of 1 finished piece per hour.

here's THE MACHINE

... that licks it!



GISHOLT
No. 24 Hydraulic
Automatic Lathe

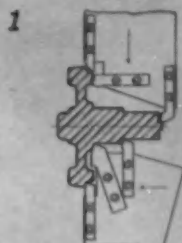
Here's how Western Gear Works of Belmont, California, solved their problem:

With two longitudinal carriages and two transverse tool slides, the standard No. 24 machine has the flexibility to combine rapid traverse and feed in several directions. Hydraulic controls make it very simple to change setups.

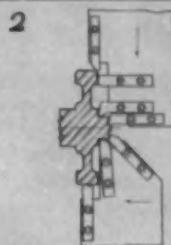
Now, note how tooling costs were cut by using mounting plates instead of special

slotted tool blocks. Large tool bit shanks are slotted, and thus are easily set before final bolting down. The complete riser blocks are quickly interchanged for various operations. And here, again, Gisholt's traditional power and rigidity show up on cuts that pull up to 80 h.p.

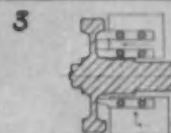
For low costs on tough jobs, think first of the Gisholt No. 24 Hydraulic Automatic Lathe. Write for literature.



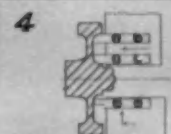
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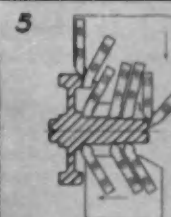
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8.8 min.



8.8 min.



6.7 min.



6.7 min.

GISHOLT

MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of
specialists in machining, surface-finishing and
balancing of round and partly round parts.
Your problems are welcomed here.



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

M & E Mfg. Co. Acquires ABS Paint Spray Business

Purchase of the paint spray business of Kellogg Div. of American Brake Shoe Co. has been announced by Rudolph Egner, president of the M & E Manufacturing Co. The purchase involves all patents, designs, tools, equipment, and material connected with the Kellogg-American paint spray line.

All Kellogg paint spray facilities are to be transferred to the M & E home office and factory in Indianapolis, Ind., and all manufacturing, sales and service will be handled from the home office. M & E will continue to serve the large volume of automotive business held by the Kellogg Div. paint spray line.

Zeder Tells Future Engineers Of Key Requisites to Career

The ability of an engineer to get along with others on his job is just as important as his technical education, in the opinion of James C. Zeder, engineering vice-president of Chrysler Corporation. In a talk before a group of undergraduates at the University of Notre Dame recently, he expounded on the non-technical phases of engineering which he considers es-

sential in an engineering career.

Sociological aspects which Zeder feels are essential to a successful engineering career are (1) the need of proper understanding of people, (2) cultivating the practice of studying the other person's viewpoint, and (3) facility of expression. Summing up the latter, Zeder said that "your reputation will be built on how well you get your ideas across, rather than how technical and scientific you sound."

Hint Car Dealers May Distribute Ford Stock

Ford Motor Co. has refused to comment on a report in a New York newspaper that the Ford family and the Ford Foundation may offer stock in the company for sale through its dealers.

Although the company so far has not indicated when the stock would be offered nor how it would be distributed, such a plan could be feasible. A basic purpose, of course, would be to attract more traffic into Ford dealer showrooms.

More Than \$132 Million Spent on Car Ads In '54

An indication of automobile company advertising expenditures comes from the National Automobile Dealers Association. Since a breakdown of newspaper expenditures is not yet

available for 1954, NADA uses 1953 statistics. Combining those with the amount spent on magazine, radio and television, NADA estimates car companies spent more than \$132 million last year to advertise cars and trucks.

It is likely, however, that the total figure will be much higher because of the extensive promotion of the 1955 cars in the latter part of the year. It was estimated that the Big Three car makers alone spent at least \$113 million.

General Motors led the list with expenditures of \$53.9 million; Ford, \$31.1 million; Chrysler, \$27.7 million; American Motors Corp., \$7.3 million; Studebaker-Packard, \$6.9 million; and Kaiser-Willys, \$5.5 million.

Two GM Divisions Claim Feats in Idea Program

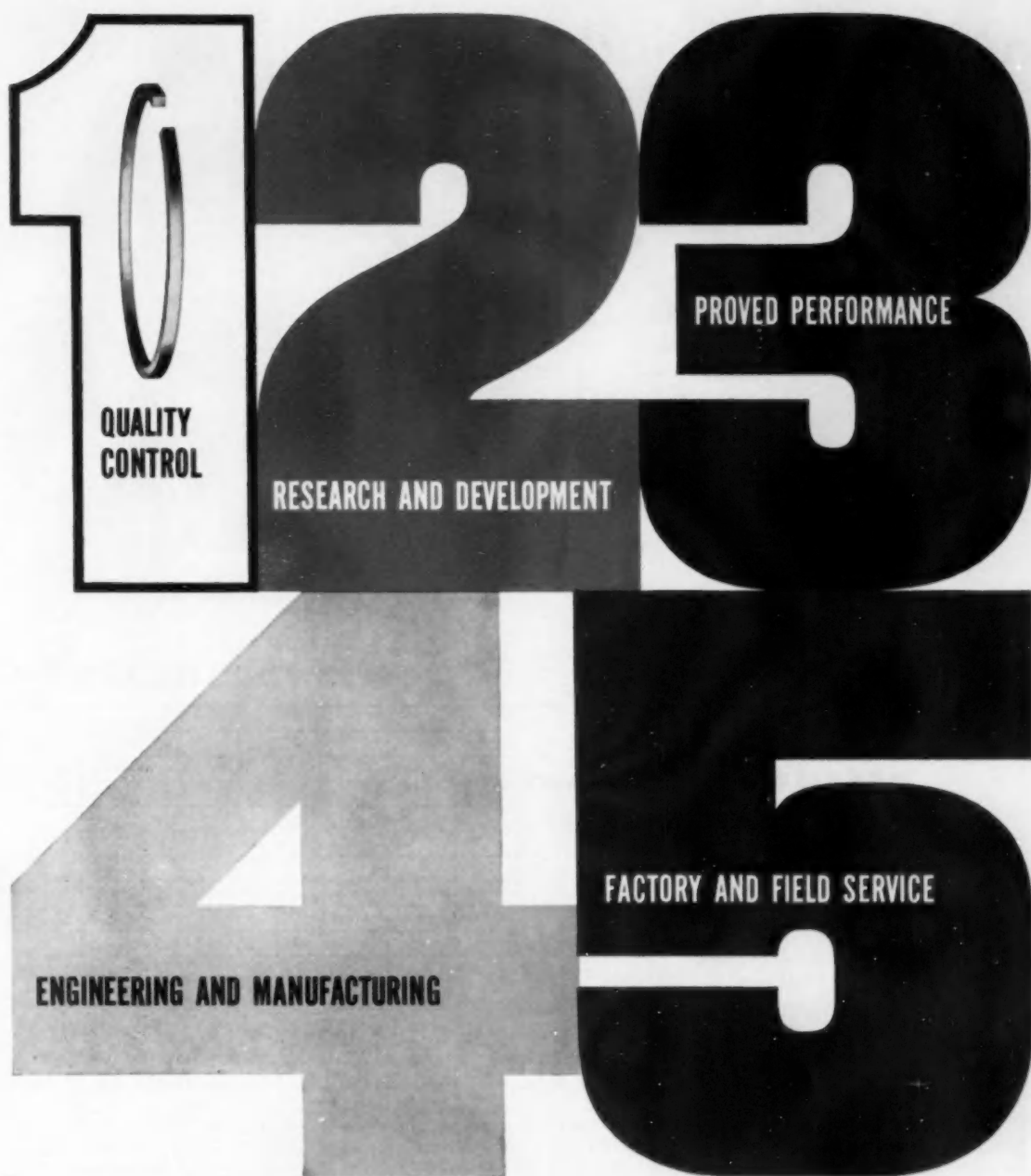
Two GM divisions boast of new feats in their employee suggestions programs. Fisher Body claims it is the first GM division to have distributed \$2 million with the latest award of \$2,500 to a worker in its Hamilton, Ohio, stamping plant who suggested a change in the blank width of steel sheets and in die design. At a Chevrolet plant in Flint a diemaker collected \$5,000 within three months for two separate suggestions, the biggest amount a Chevrolet employee ever won in a three-month period. His ideas dealt with improvements in a stamping press.

WEST SOUTH CENTRAL AREA ONLY ONE NOT GAINING IN MARCH OVER FEBRUARY

Regional Sales of New Passenger Cars

Zone	Region	March 1955	February 1955	March 1954	Three Months		Per Cent Change		
					1955	1954	Mar. over February	Mar. over Mar. 1954	Three Months 1955 over 1954
1	New England	34,191	24,352	29,138	84,081	67,017	+49.40	+17.34	+25.46
2	Middle Atlantic	132,861	81,371	83,935	294,177	228,080	+63.28	+41.44	+29.97
3	South Atlantic	79,085	63,891	51,535	200,229	141,563	+17.69	+45.70	+41.44
4	East North Central	167,589	124,807	133,278	401,968	314,271	+34.17	+25.74	+27.81
5	East South Central	33,004	24,679	24,369	79,596	60,553	+33.73	+35.43	+31.23
6	West North Central	58,858	42,305	47,080	142,080	110,892	+39.13	+25.02	+26.12
7	West South Central	42,030	44,190	40,300	123,210	118,144	-4.89	-7.22	-4.29
8	Mountain	19,197	13,954	13,282	44,380	34,604	+30.41	+27.00	+28.25
9	Pacific	74,719	57,135	42,614	182,994	119,787	+30.78	+74.82	+58.04
Total—United States		638,534	476,504	488,731	1,982,730	1,191,021	+33.96	+32.41	+36.37

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt.; Zone 2—N. J., N. Y., Pa.; Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.; Zone 4—Ill., Ind., Mich., Ohio, Wis.; Zone 5—Ala., Ky., Miss., Tenn.; Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D.; Zone 7—Ark., La., Okla., Tex.; Zone 8—Aris., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.; Zone 9—Cal., Ore., Wash.



These are five important reasons for the *overwhelming* preference for Perfect Circles. And, 35 out of 37 manufacturers using chrome rings specify **PERFECT CIRCLE** piston rings!

Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario



Compressor and turbine wheel combined in a single structure

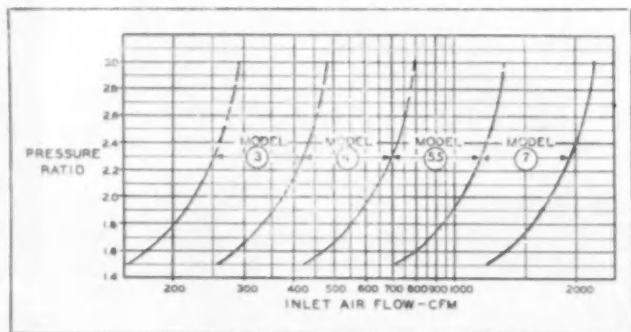


Model 5.5 Miehle-Dexter turbo supercharger

CONSTRUCTIONAL DETAILS

of New

Miehle-Dexter Turbocharger



FLOW RANGE CHART

THE high-pressure turbochargers recently brought out by Miehle-Dexter for engines from 50 to 1000 hp are of monorotor construction—that is, the compressor impeller and the turbine wheel are combined in a single rotor structure. Compressor blading is carried on one side of the rotor hub and the centripetal turbine blading on the opposite side, as illustrated. The complete rotor is a single precision casting made from a special high-strength, high-temperature alloy, which is said to permit great accuracy in manufacture and the attainment of the precise blade shapes needed for this high-performance turbocharger.

The monorotor type of construction is said to eliminate windage and leakage losses, thereby contributing to the high efficiency of the units. In

addition, this type of construction permits cooling of the turbine side of the rotor in a very simple manner—a small quantity of the air handled by the compressor impeller is by-passed into the turbine, where it is directed (in the form of a thin sheet) over the turbine rotor hub, blanketing it from the heat of the gases.

Other unique construction features are specially-developed anti-friction rotor bearings, and flexible mounting thereof, and their self-contained lubrication. This new development in rotor mounting is claimed to result in long bearing life.

This new turbocharger is completely independent of the engine—not only with regard to lubrication of the unit, but also with regards to engine cooling-

(Turn to page 106, please)

Whether it's steering linkage parts for
a 1928 auto...



...for today's
production models...

or that 195~~X~~ experimental job...

You can count on



Thompson

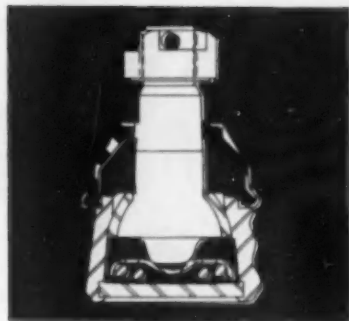
YES, manufacturers of automobiles, trucks, tractors and buses look to Thompson for a long list of dependable parts.

The Thompson Dual Bearing tie rod end is typical of Thompson Products' contribution to today's automobile. Among the many other Thompson products found on today's automobiles are the revolutionary new Thompson-engineered Ball Joints used in front wheel suspension and complete steering linkage units.

And typical of Thompson's dependability as a source of supply is the fact that Thompson is still manufacturing replacement steering linkage units for cars up to 27 years old.

Tomorrow's cars will use Thompson products, too, because automo-

tive manufacturers have learned they can count on Thompson to develop and manufacture dependable parts. If you use steering linkage units, why not use "Steering Linkage by Thompson". For full details on how Thompson can help you with your steering linkage problems, write, wire or phone Thompson Products, Inc., Michigan Division, 7881 Conant Avenue, Detroit 11, Michigan, WA 1-5010.



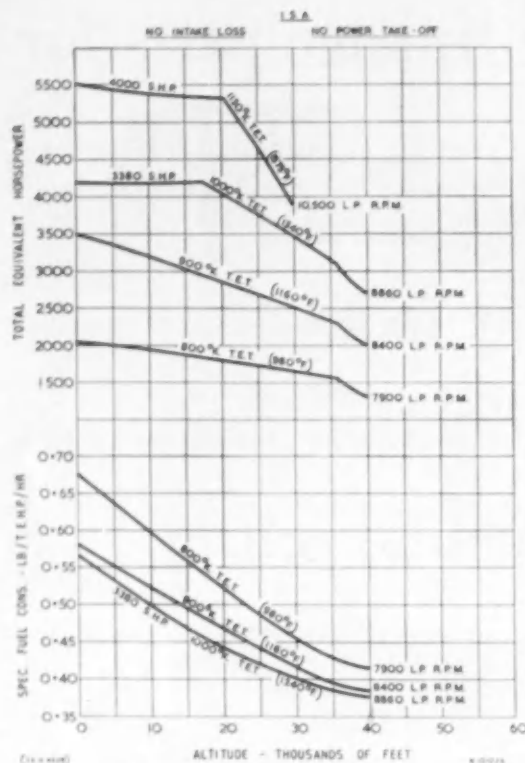
A Tie Rod End ball stud should fit snug in the socket. Any tie rod end starts that way but the extra bearing surface in the Thompson Dual Bearing tie rod end keeps the stud snug in the socket far longer.

Thompson Products

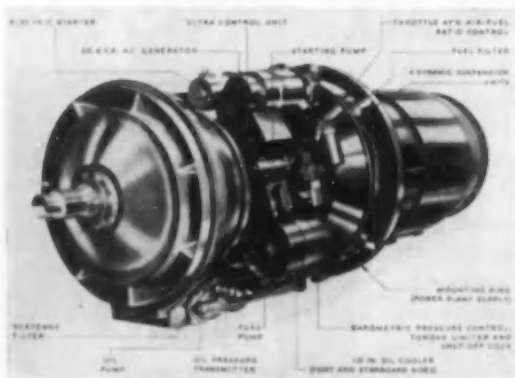
MICHIGAN DIVISION

DETROIT • FRUITPORT • PORTLAND

The Bristol BE25 Turboprop



Total equivalent horsepower of BE25, and specific fuel consumption, 220 mph EAS assumed



Mock-up of the BE25 engine

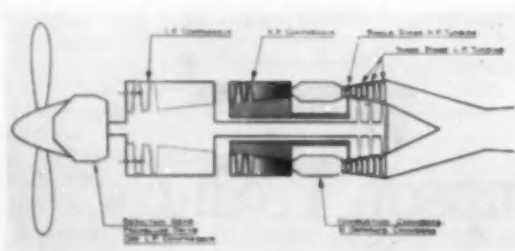


Diagram of arrangement of BE25 engine

THE BE25 engine, introduced by the Bristol Aeroplane Co., in England, is a constant-power engine which does not lose the usual percentage of power with gain in altitude or when operating at high climatic temperatures.

The shaft horsepower available for take-off at sea level in temperate climates is likewise available for take-off at any air field in the world, irrespective of elevation or tropic temperature, and is also maintained during climb to heights of the order of 20,000 ft.

This performance is made possible by the fact that the BE25 is, by normal standards, an engine of about 8000 hp. However, the power output is torque limited to about 4000 hp and until the aircraft climbs to an altitude at which an ordinary 8000 hp engine would drop in power to 4000 hp, this same 4000 hp is available to the propeller.

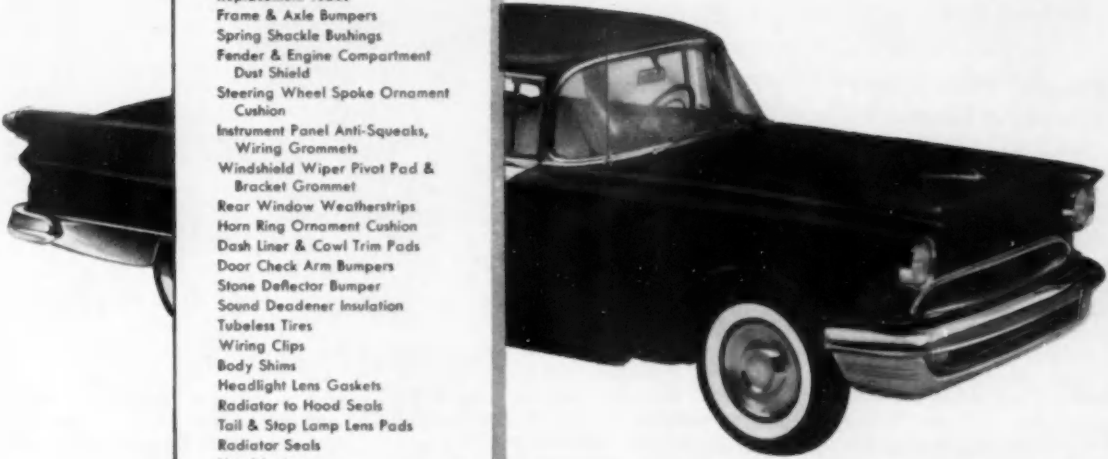
As height above this "ceiling of constancy" is gained, the power will diminish according to the usual rules. Nevertheless, the power available at a cruising altitude of about 30,000 ft will be approximately 3500 ehp.

The BE25 has a design resemblance to both with the Proteus turboprop and with the Olympus turbojet. It is a "two-spool" engine (as is the Olympus) in which a low pressure compressor supercharges a high pressure compressor, each being mechanically independent of the other. This compressor system allows the use of a high pressure ratio (10:1) which in turn makes possible unusually low specific fuel consumption—for example, at 25,000 ft and 300 mph, the design specific consumption is 0.37 lb/hp/hr.

Simca Planning Expansions To Increase Car Production

Simca, which merged with Ford of France (Ford S.A.F.) in November, 1954, has announced plans to spend about \$57 million for expansion during the next five years. Biggest phase of the program will be the addition of three single-story production plants to the present facilities at Poissy, about 15 miles from Paris.

Simca's recently acquired Ford S.A.F. plant at Poissy is currently turning out the Vedette, while the Aronde line comes from the Nanterre plant. Combined production of these two plants is currently 700 cars a day. The expansion program is designed to lift it to 1000 units a day.



- Steering Collar Insulator
- Radiator Hose
- Heater Hose
- Body Insulators
- Heater Can Anti-Squeak Pad
- Steering Post Bracket Insulator
- Spark Plug Covers
- Steering Post Pads
- Radiator Drain Tube
- Silent Block Bushing
- Tail Pipe Insulator Support
- Wiper Hose
- Antenna Gaskets
- Division Channel Weatherstrip
- Window Channel Filler Seal
- Parking Light Lens Gaskets
- Bumper to Fender Spacer
- Fresh Air Adapter Grommets
- Battery Drain Tubes
- Gearshift Lever Arm Bushing
- Replacement Tubes
- Frame & Axle Bumpers
- Spring Shackle Bushings
- Fender & Engine Compartment
- Dust Shield
- Steering Wheel Spoke Ornament
- Cushion
- Instrument Panel Anti-Squeaks,
- Wiring Grommets
- Windshield Wiper Pivot Pad &
- Bracket Grommet
- Rear Window Weatherstrips
- Horn Ring Ornament Cushion
- Dash Liner & Cowl Trim Pads
- Door Check Arm Bumpers
- Stone Deflector Bumper
- Sound Deadener Insulation
- Tubeless Tires
- Wiring Clips
- Body Shims
- Headlight Lens Gaskets
- Radiator to Hood Seals
- Tail & Stop Lamp Lens Pads
- Radiator Seals
- Hood Lacing
- Fender Seals
- Hood Bumpers
- Bumper Grommet
- Glove Box Door Bumpers
- Gas Tank Filler Neck Grommet
- Sill Mats & Attaching Grommets
- Defroster Hose
- Door Bumpers

**over 100 parts
made from Enjay Butyl
now used
in '55 models**

This car, like many other 1955 models, is setting new standards of performance and appearance. It is protected in vital places by parts made from Enjay Butyl—the super-durable rubber that outperforms and outlasts other types of rubber used in similar applications.

Enjay Butyl is amazingly resistant to weather, wear, and deterioration. It does not crack, chip, or lose its resiliency even under extreme conditions of use and climate. Butyl parts *stay like new*.

Butyl was developed exclusively by affiliates of the Enjay Company, Inc., and is now available in *new* non-staining grades for white and light-colored automotive parts. For full information and for technical assistance in the uses of Enjay Butyl, contact the

**Enjay Company, Inc., 15 W. 51st St., New York 19, N. Y.
District Office: 11 South Portage Path, Akron 3, Ohio.**



METALS

(Continued from page 94)

line sheet, which has great advantages over the conventional type pot sheet, will regain some of the tonnage lost to aluminum sheet in recent years. In diecasting, aluminum is still a long way behind zinc as a preferred material but zinc producers are fully aware that aluminum is hot at their heels. For this reason many producers are unwilling to see the price of their metal go any higher as they would lose a competitive price advantage. Aluminum producers are aggressive sellers and have not hesitated to use advertising to a far greater extent than has the zinc industry in pushing its product.

Copper Price Drops Sharply in London

While copper is still in tight supply, the situation has eased measurably and will probably improve more before midsummer. The sky-high price in London broke precipitately when members of the powerful Prawn group that controls about half the Rhodesian production announced their decision to sell copper at a fixed price of 35 cents per lb for 30 days to their British customers in order to instill stability into re-sale prices for copper and brass products. This bypassed the rapidly fluctuating prices on the London Metal Exchange, where copper had sold as high as 46 cents per lb.

In effect, this gave British users the lowest priced copper in the world. The action brought not unexpected approval from consumers and met as well commendation from prominent executives in this country and abroad.

The immediate effect in our own market was to moderate interest in forward metal and to increase offerings of copper scrap, which dropped sharply from 35 cents to 31 cents per lb. It is believed that the heavy purchases of scrap will bring increased supply of electrolytic copper within 60-90 days as soon as it can be refined. Another probable result will be to direct exports of Chilean copper to the United States instead of to London and so further to increase the supply to domestic consumers.

Chile Relaxes Curbs on Copper

Quite as important from a longer range standpoint was the action of the Chilean Government in lessening

the curbs on American-owned copper mines and giving the companies, Anaconda and Kennecott, opportunity at long last to control their own copper sales. Instead of receiving 24½ cents per lb for their metal, the companies now get the full market price for copper and instead of paying about 5 cents for a peso, pesos will cost them about one-half cent. The law is ingeniously devised so as to encourage increased production by setting a lower income tax rate as output grows. Both companies have announced their intention to increase production accordingly. A greater flow of copper to this country should result.

Output of crude copper (including secondary) in U. S. in April totaled 103,880 tons, up about 1300 tons from the four-month average.

Zinc Statistics Excellent

Not even the most optimistic zinc producers had envisioned the startlingly good statistics released by the Zinc Institute for April. Shipments to domestic users during the month totaled 89,441 tons, highest since 1945. Stocks of zinc in the hands of smelters declined to 74,745 tons at the end of April, a reduction of 1600 tons in the month or over 135,000 tons since the peak was reached a year ago. At the same time smelter production reversed its upward trend and declined moderately.

Demand continued extraordinarily high, aided by record activity in the steel and automotive industries. It is estimated that 1955 cars are using about eight times as much zinc for diecastings of grilles and hood ornaments as in 1954. For some models this calls for 40 lb of these diecastings.

The present 12 cent per lb price for zinc appears firmly established as a floor. Since buying for the stockpile began last June, Government purchases have been a strong market support, but producer offerings in April were sharply reduced because of heavy industrial demand. Consequently the goal of 300,000 tons to be acquired before June 30 is far from having been achieved.

Washington has indicated that the Government will be in a position to acquire both lead and zinc for price-propping purposes through the rest of 1955 and all of 1956. A reasonable interpretation would be that stockpiling will continue until at least 300,000 tons have been bought. It is now believed that no opposition would

be met to paying 13 cents per lb for zinc if it were not available at less.

Lead in Industrial Demand

Industrial demand for lead has been so good that offerings for the stockpile have been limited. There is little talk, however, of a higher price. Most producers are making satisfactory profits at 15 cents per lb.

Use of lead in production of storage batteries may be up 20 per cent in 1955, to total 400,000 tons. The 12-volt battery will contain about 30 per cent more lead than the 6-volt type, and is coming into wider use. A favorable outlook holds for increasing use of tetraethyl lead but lead sheathed cables are meeting increasing competition from rubber-jacketed cables and aluminum sheaths.

Shipments of replacement batteries by U. S. manufacturers totaled 4,445,000 units in the first quarter of 1955, slightly more than in the same period of 1954.

MACHINERY NEWS

(Continued from page 80)

place. Meanwhile, we'll go still farther . . . to the seventh decimal place.

We readily recognize more and more the need for agreement in basic accuracy as between plants and departments within the same plant, and of course the same need exists, merely on a larger scale, as between nations. The machine operator understandably wants and needs as much tolerance on a blueprint as possible.

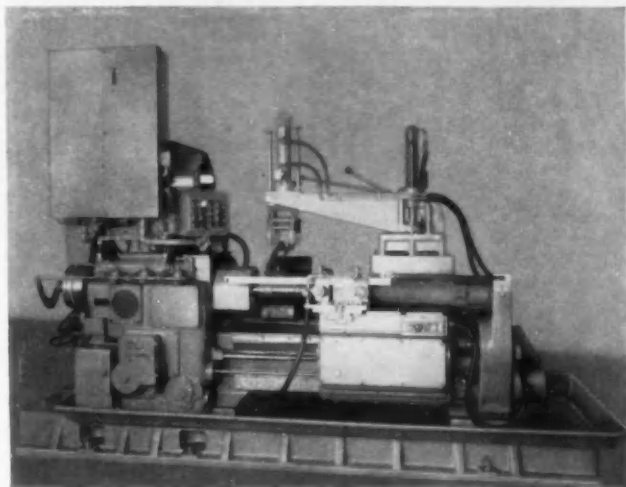
Diesel fuel injection parts handle problems of 25,000 psi from hot gases which must not escape or pass between mating moving functioning parts with dimensions in the area of 0.375 in., but still not seize or freeze either. To hold the gases at that pressure sometimes requires male and female clearance of about 25 millionths give or take a few millionths to achieve practical, economical operating conditions.

Right now, today, some machine tool builders manufacture grinding, honing and other machine tools and measuring equipment which enable economical production and classification of such parts for selective assembly, on the basis of plus or minus 5 millionths of an inch or less.

If the part itself is to have plus or minus 5 millionths, with 90 per cent of that tolerance for manufacture (Turn to page 104, please)

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



MODEL AP Lo-swing LATHE SPEEDS MACHINING OF 155mm SHELLS

PROBLEM: To finish turn ogive and copper band on 155mm shells.

SOLUTION: A Model AP Lo-swing Lathe, tooled as illustrated, was selected for this job since its rack and pinion carriage feed permits any length of feed within the capacity of the bed. This feature was particularly advantageous because of the exceptional length of the nose of the shell and overlapping of multiple tools was not permitted.

For this particular operation, the machine, which is basically a semi-automatic lathe, was equipped with a full automatic cycle. The operator simply loads and unloads the shells with the pneumatic loader and pushes the starting button. The



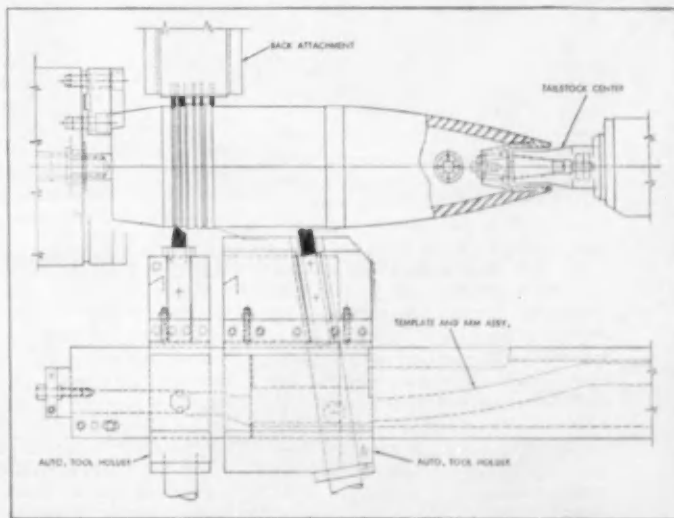
spindle stops automatically at the end of the machine cycle with the carriages and tools returned to the starting position.

The spindle drive is through a variable speed electric motor with an automatic control mechanism which maintains a constant cutting speed over the full length of the ogive. This is important, as the nose of the shell must have a fine, smooth and polished surface, which is obtainable only with a constant cutting speed. Production is also improved when a constant cutting speed is maintained.

The line drawing shows the tooling designed for this job. The piece is held and driven with a three-jaw, air chuck and supported on the tailstock end with an expanding collet. The front template which controls the form of the ogive and the copper band is clearly shown as well as the automatic back squaring attachment which carries the grooving tools.

Production is 44 shells per hour at 100% efficiency. Bring your turning problems to Seneca Falls.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.



PRODUCTION COSTS ARE LOWER WITH Lo-swing

MACHINERY NEWS

(Continued from page 102)

ture and assembly, . . . then, by the Rule of Ten, the gage should be accurate to plus or minus one-tenth of that, or one millionth. But the gagemaker also works to standards. And if the Rule of Ten also covers him . . . he brings us to the seventh decimal place. What's more, if the Rule of Ten is still in force, the basic reference standard back of the gagemaker must be accurate to the eighth decimal place.

We have practical requirements for that right now; e.g., in the aircraft industry, where weight, horsepower and safety constantly challenge each other, precision is vital since maximum performance and safety must combine with minimum metal and weight.

Consider the ball bearing, for instance. Two ten-thousandths tolerance on an inner or outer ring of a two-inch ball bearing is one thing. But suppose the outer race of an aircraft instrument bearing is smaller in diameter than your little finger, and the inner race still smaller. There two ten-thousandths threatens to be relatively big, not small. And for basic accuracy as well as repetitive size, the seventh decimal place again becomes critical.

Extremely close tolerances are employed on some valve controls for the very large hydraulic presses manufactured in our own industry, as well as for automotive power steering devices and automatic transmissions, now familiar, everyday products. We cannot fear such tolerances as man dives deeper and cruises farther in his new submarines, flies higher and faster in new planes, and sends new guided missiles on their missions. At plane speeds of more than 1800 mph, and at missile altitudes up to 250 miles, with I.B.M. speed projections above 10,000 mph, we are confronted with some very swiftly moving levers and fulcrum points in relationship to the distant earth.

All of us agree—there should never be close tolerances merely for their own sake. Rather, the goal is—production at the widest tolerances permissible with required performance plus needed interchangeability for manufacturing and maintenance. As we raise our performance standards, we are often forced to raise our precision standards . . . which sometimes means narrow our permitted tolerances.

Interestingly, the world still uses

the principle of Albert A. Michelson's wide-beam interferometer, developed in 1887, in improving the standards of measurement. Michelson measured the international Meter at Paris in terms of the interferometer's light waves, and established an alternate definition of 1,553,164.13 wave lengths of red light emitted by cadmium vapor lamp when excited under certain stipulated conditions. With some oversimplification, the operating principle is the splitting of a light beam in two, with one part directed over a known length of path, enabling known comparison with the fringes of the other split beam, which has been directed toward the object whose size is sought. The fringe difference in the reflections of these two beams (one known and one unknown) discloses the difference in the lengths of the two split paths and thus the size sought.

Now, in using light waves to determine basic standards, we can compare two light wave lengths of different spectral lines with errors not exceeding one or two parts in fifty million.

But comparing a light-wave length with a metal-gage length is sort of like comparing pepper with peppermint. Each means of measuring has varying characteristics and is affected very differently by changes in any or all of the surrounding conditions. Thus, in reaching the seventh decimal place, there are some very interesting problems among the possible sources of repetitive errors. For instance,

the diamond tip of a one-eighth inch radius plunger on a mechanical gage, when applied with a pressure of 6.4 ounces, penetrates a steel gage to the extent of 100 ten-millionths of an inch; whereas, for a carbide gage, the penetration is only 66 ten-millionths of an inch . . . indicating a false difference of length amounting to 34 ten-millionths of an inch. And other materials show other variations . . . for fused quartz the penetration is 200 ten-millionths.

Moreover, light itself seems to penetrate the surface of a steel gage during interferometric measurement . . . much as the previously mentioned plunger penetration on a mechanical comparator. This is known as the "change of phase" which accompanies surface reflection from light-absorbing materials. This optical effect is less than 1/5 that of mechanical penetration . . . less than 20 ten-millionths, maybe 7 millionths of an inch under favorable conditions. Degree of penetration is also affected by polish of the gage surface.

Measured in a vacuum, there is a change of 3 ten-millionths of an inch for the length of a one-inch steel gage (and 9.9 ten-millionths for fused silica). Surrounding temperature and temperature change become important, as does even the index of refraction of air. These, of course, are typical of the problems encountered in progress toward a basic foundation of measurement accurate to the seventh decimal place.

AUTOMATION NEWS REPORT

(Continued from page 72)

mated, it should be possible to increase the communication between office and factory. The goal should be systems of equipments which include programmers, monitors and computers to set production in motion, monitor intermediate results, and determine adjustments, etc."

WHAT'S HAPPENING

Wayne University in Detroit again is offering one-week courses in its computation laboratory. Four weekly courses beginning June 6 are of increasing complexity. The first assumes no previous knowledge of computing machinery. Call A. W. Jacobson, head of the laboratory for information on the courses and fees.

Five sessions on automation make up the two-day program of the Radio-Electronics - Television Manufactur-

ers Association symposium, to be held Sept. 26-27 at the University of Pennsylvania, Philadelphia. Further information may be obtained from the Association at 777 14th St., N. W., Washington 5, D. C.

G. E. AUTOMATION PLANT

Headquarters for General Electric's Specialty Control Dept. has moved to its new home at Waynesboro, Va., from Schenectady where it was established in 1953. It will make equipment for punched card control of machine tools, electronic motor controls, and aircraft relays. Already plans for expansion are under way, said Dr. L. T. Rader, manager of the department. It will eventually employ up to 600 people. Another new plant, for the Industry Control Dept., is being built near Salem, Va.

for



GRINDING WHEELS

MOUNTED POINTS

ABRASIVE SEGMENTS

POLISHING GRAIN

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ABRASIVE CO.**



at your service with extra service

What's your idea of service? Here's ours! A distributor network geared to help you over production crises as well as in your everyday grinding problems. Free consultation with our field engineers to search out new economies for you. Close teletype communication between our main plant and branches to expedite your orders. New mass production equipment to give you 3 to 4 weeks delivery on small diameter wheels . . . plus the extra product service inherent in Simonds manufacture. If this concept of service coincides with yours, get it by specifying Simonds Abrasive products.

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Simonds Canada Saw Co., Ltd., Montreal, Quebec, Lion Grinding Wheels Div., Brackville, Ont. and
Simonds Canada Abrasive Co., Ltd., Arvida, Quebec





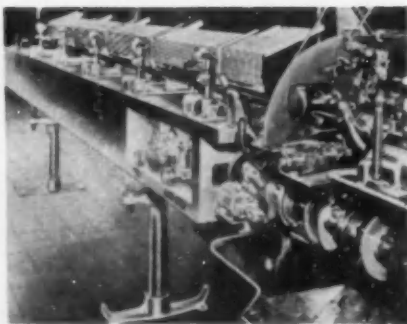
Why let the 4th DIMENSION limit your machine tool output?

A trip to the washroom or tool crib, a halt for feed finger repair, a spinning empty chuck—these interruptions to the steady flow of production can never be made up... for TIME, the 4th Dimension, waits for neither man nor machine.

Over 150 firms have learned how to use every minute of every shift for continuous, 4th Dimension production. Here's how...

Lipe A.M.L. Bar Feed Eliminates Time Losses, Increases Output 30% or More

The Lipe Automatic Magazine-Loading Bar Feed is an air-operated attachment which holds an 8-hour supply of bar, rod or tubing and feeds it continuously to any machine equipped with a fixed stop. There are no feed fingers to break down—nothing to scratch or mar polished stock. It will feed any length in one feed-out, thereby cutting cycle time. Remnants are ejected automatically. Idle operation ("cutting air") is eliminated.



Send for this free book. Shows how to convert your machine tools to 4th Dimension Production.

LIPE-ROLLWAY CORPORATION Syracuse 4, N.Y.

Send me free book on how to gear machine tools to the steady flow of Time.

Name Title

Company

Street

City Zone State

Miehle-Dexter Turbocharger

(Continued from page 98)

water requirements. No water jacketing of any kind is used.

While the turbine wheel operates with full admission and steady flow, and therefore with maximum possible efficiency, provisions have been made for the recovery of the energy in the engine exhaust pulsations. These provisions amount, essentially, to incorporation of a De Laval pulse converter system into the turbine nozzle box.

For careful matching of the turbocharger to the engine, the turbine nozzle guide vanes are so constructed that their position can be varied in the field. This adjustable turbine nozzle guide vane feature means that one and the same turbine can readily be adapted to a wide range of engine flow requirements or engine operating characteristics.

The Miehle-Dexter turbocharger can be mounted either vertically, horizontally, or in any angular position. Construction of the unit permits rotating the compressor housing vs. the turbine nozzle box into any angular relationship desired.

The extremely light weight and low inertia of the rotor, combined with high turbine torque characteristic, provide instantaneous response to engine load changes. For special applications the unit can be supplied with automatically adjustable turbine nozzle guide vanes—for example, to achieve increasing engine torque with decreasing engine.

According to the manufacturer, high pressure ratios of the turbocharger, up to 3 to 1, permit doubling (and in some cases as much as tripling) engine output.

These new units, which have been developed under a license agreement with the De Laval Steam Turbine Co., will be available in four standardized models to suit a wide range of engine sizes. They are now being tested by makers of both two- and four-stroke engines. Capacities are given in the flow chart reproduced here.

AUTOMOTIVE INDUSTRIES...

is your News Magazine of
Automotive and Aviation

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by **SUPERIOR**



for the
uniform behavior
you require
in fabrication!
in service!

Uniform, dependable response to your manufacturing processes and subsequent service requirements is outstanding in SUPERIOR Spring Steel. We build uniform behavior into every coil, from specified analysis of composition to final anneal before shipment. We're strip steel specialists: *you gain by it.* Specify SUPERIOR for your spring steel needs!

Superior Steel

CORPORATION

CARNEGIE, PENNSYLVANIA

NEW

plastic lamp socket

SEALS OUT MOISTURE and DUST

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Canadian International Air Show,
Toronto, Ont. June 4-5
American Welding Society, spring
meeting, Hotel Muehlebach,
Kansas City, Mo. June 7-10
Paris Aeronautical Show, France
June 10-19
Le Mans 24-Hr Race, France, June 11-12
SAE Golden Anniversary Summer
Meeting, Chalfonte-Haddon
Hall, Atlantic City, N. J., June 12-17
ASME-IME Joint Conference on
Combustion, Mass. Inst. of
Technology, Cambridge, Mass.
June 15-17
ASME National Applied Mechanics
Conference, Rensselaer Poly-
technic Institute, Troy, N. Y.,
June 16-18
ASME Semi-Annual Meeting, Hotel
Statler, Boston, Mass. June 20-23
ASTM Annual Meeting, Chalfonte-
Haddon Hall, Atlantic City,
N. J. June 26-July 1
American Nuclear Society, first an-
nual meeting, Penna. State
Univ., State College, Pa. June 27-29
Western Plant Maintenance and
Engineering Show, Pan Pacific
Auditorium, Los Angeles, Calif.
July 12-14
SAE Golden Anniversary West
Coast Meeting, Hotel Multno-
mah, Portland, Ore. Aug. 15-17
NICE Symposium on Electronics
and Automatic Production, San
Francisco, Calif. Aug. 22-23
Western Electronic Show and Con-
vention, Civic Auditorium and
Fairmont Hotel, San Francisco,
Calif. Aug. 24-26
National Aircraft Show, Interna-
tional Airport, Phila., Pa. Sept. 3-5
Farnborough Air Show, England
Sept. 5-11
Paris Automobile Show, France
Sept. 6-16
NMTBA Machine Tool Show, Inter-
national Amphitheater, Chicago,
Ill. Sept. 6-17
Production Engineering Show, Navy
Pier, Chicago, Ill. Sept. 6-17
Coliseum Machinery Show, Chicago,
Ill. Sept. 6-17
SAE Golden Anniversary Tractor
Meeting and Production Forum,
Hotel Schroeder, Milwaukee,
Wis. Sept. 12-15
Instrument Society of America, 10th
annual Instrument-Automation
Conference and Exhibit, Shrine
Exposition Hall and Auditorium,
Los Angeles, Calif. Sept. 12-16
National Petroleum Association, an-
nual meeting, Traymore Hotel,
Atlantic City, N. J. Sept. 14-16
National Industrial Packaging and
Materials Handling Show, Kings-
bridge Armory, New York, N. Y.
Sept. 20-22
First Trade Fair of the Atomic In-
dustry, Sheraton-Park Hotel,
Washington, D. C. Sept. 26-30
AIEE Fall General Meeting, Hotel
Morrison, Chicago, Ill. Oct. 2-7
World Plastics Fair and Trade Ex-
position, National Guard
Armory, Los Angeles, Calif. Oct. 5-9
SAE Golden Anniversary Aeronautic
Meeting, Production Forum,
and Engineering Display, Hotel
Statler, Los Angeles, Calif. Oct. 11-15
National Metal Exposition, Con-
vention Hall, Philadelphia, Pa. Oct. 17-21

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Automatic Painting of Passenger Cars

(Continued from page 65)

tion is removed from the body with the use of a powerful vacuum system. The body then progresses through another spray booth, receiving a color coat on the door and window openings and the exposed interior metal. The tops also receive a light color coat. The body is again oven-dried, and before the next color coat, is given a light scuffing or

sanding to remove any blemishes. As it enters a third spray booth it receives a manual spray for the areas inaccessible to the automatic sprays, which follow immediately. There are two of these automatic spray machines, spaced approximately a minute or conveyor travel apart. They spray cowl, sides, top, and deck lids. A trigger is pre-set on the body truck

that actuates the machine to adjust for the different contours of coupes and four-door sedans. A minimum of work remains for a spray man to blend in the sprayed area with the area inaccessible to machine spraying.

Again, after oven drying, the body is inspected, and if a two- or three-tone job, is carefully masked off. The two-tone areas are scuffed and the body returned to a fourth spray booth where the two-tone color is applied by hand. Excellent inspection lighting is provided to assist in maintaining the quality of workmanship. Careful attention to the oven design helped to assure this quality. Direct natural gas burners heat filtered air with a 75 per cent recirculation for maximum economy. The ovens are multi-zoned to insure even drying temperature through the entire oven length.

Approximately half of the second floor Paint Division is devoted to the painting of sheet metal. Hoods, fenders, stone shields, etc., are received from vendor plants and are inspected, then carefully metal finished. This operation is done on the first floor of the plant, and when metal finishing is completed they are transported to the second floor of the plant by overhead conveyors. These are sent to the second floor in the approximate order of anticipated need by the final assembly line, but final scheduling is done after painting. Arriving at the second floor level, they are passed through an automatic prime flow coat system.

After receiving the prime coat, two fenders and a hood are placed on a special spinner-type conveyor rack. The prime is dry sanded lightly prior to being passed on to the color spray booth. In this spray booth two wet coats are applied automatically.

The "spinners" are hung on the conveyor at intervals of eight feet, eight inches, and the moving conveyor indexes at this interval and stops. Two spray machines are placed twice this distance apart with a platform between for a spray man to pick up areas inaccessible to the automatic machines. This allows both spray machines and the operator to spray different spinners at the same time.

One pass of the automatic guns from bottom to top and return is accomplished in 52 sec, in which time the spinner has made 21 revolutions. The conveyor indexes eight feet, eight inches in seconds, and the cycle is repeated.

(Turn to page 111, please)



**SURFACE BROACH
REMOVES 3/16"**

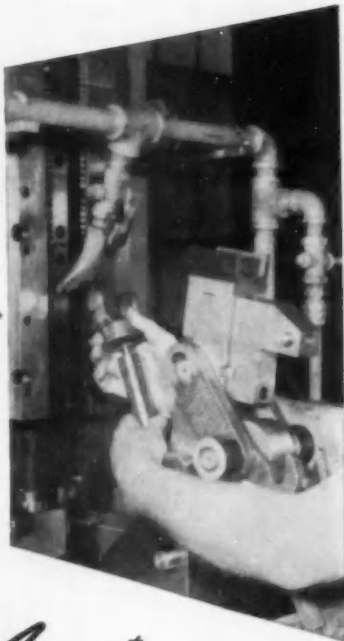
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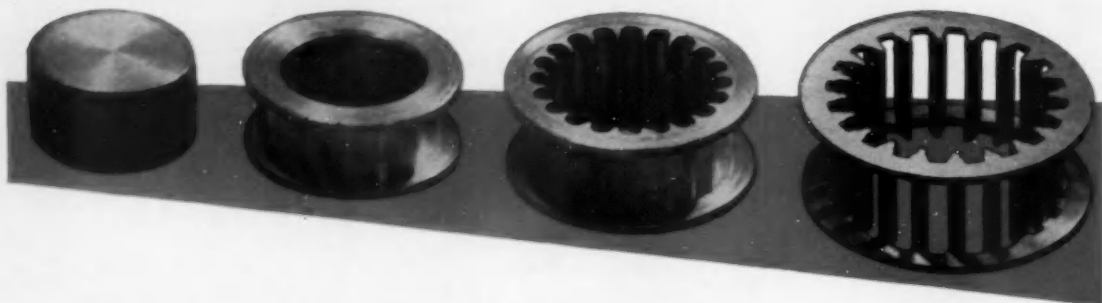
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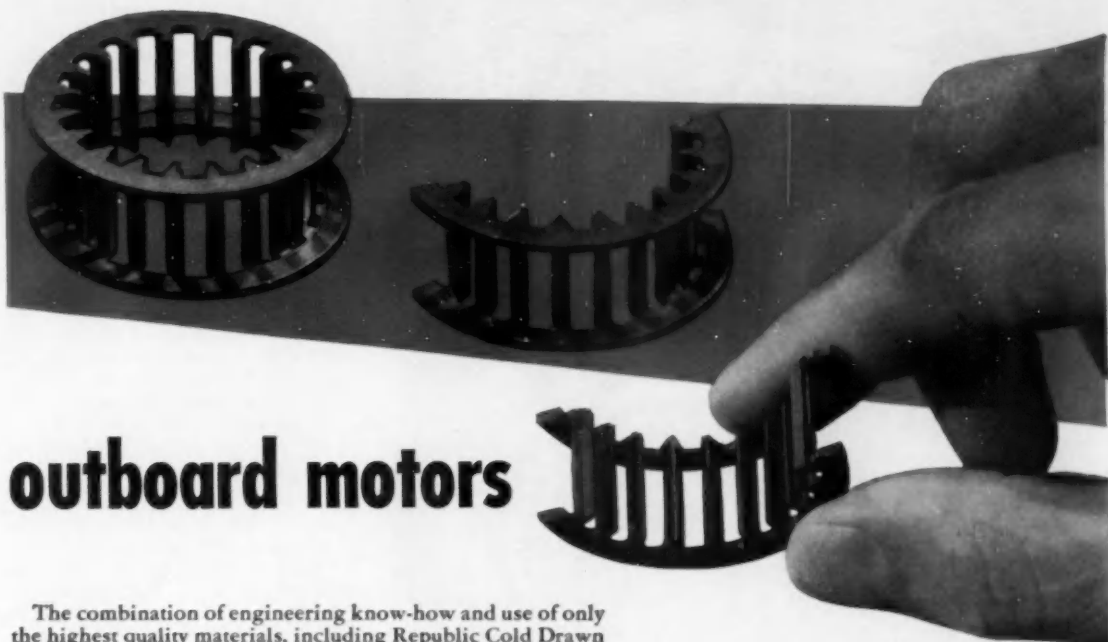
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Highly machined parts, such as the connecting rod bearing retainer shown above and the spiral bevel gears that drive the propeller shaft and other parts, are made from Republic Cold Drawn Alloy Steels.

As in many new product developments, certain difficulties were encountered in the initial stages of production. The bearing retainer, considered to be one of the most difficult parts in existence to machine, is a case in point.

During rough broaching, chips welded to the broach and tearing of the metal occurred on bearing pockets. A Republic Field Service Specialist was invited to work on this problem with Johnson Engineers. A solution was worked out through close cooperation and teamwork. The blanked parts were heat-treated to increase Brinell hardness. Broaching improved immediately. Chip adherence was eliminated. Surfaces were much smoother.

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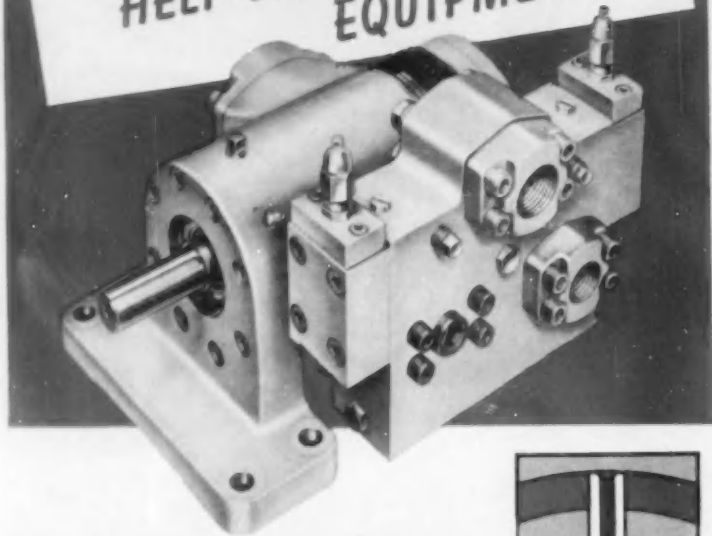
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Gear action on Johnson Motors is smooth, positive, quiet. Photo illustrates sequence of machining operations performed on the spiral bevel gears that drive the propeller shaft. Republic Cold Drawn Alloy Steels give these parts added strength and a fine surface finish.



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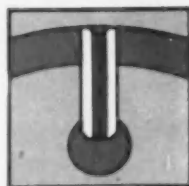


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(Continued from page 110)

Color changes require one skip; that is, a spinner not loaded, because of possible overspray of a different color settling on the work. The color change is done quite simply by disconnecting the fluid hose quick coupling and attaching another. The small amount of paint left in the gun of the former color is dissipated against the water curtain.

After passing through the color drying ovens, hoods and fenders are stored momentarily before selection for schedule requirements. It is worthy of note that due to the different moulding arrangements for the different model automobiles, it is necessary to store over one hundred sets of fenders and hoods to obtain only one of each color.

Scheduling is a major problem created by the present day color-matched automobile. Each body, as it leaves the Paint Department previously described, is placed on a firm schedule, and from that point on must proceed through the final assembly operations without interruption. The matching sheet metal, including the interior garnish mouldings, instrument panels, seat side shields, etc., must meet the body as it progresses towards the end of the final assembly line. Some of these painted parts are required only a few minutes after the body is scheduled. To assure their prompt arrival, a complex system of Teletype and TelAutograph equipment flashes schedule requirements to 40 assembly points throughout the plant.

Wheels on today's cars are usually covered by gleaming wheel disks, yet there is enough demand for matching colors to complicate a routine operation. All wheels are received at Los Angeles "in the white" and run through an automatic spray machine where a conveyor carries the rotating wheels past fixed position spray guns. Although the majority of wheels are painted black, the spray machine is piped for 14 colors from the paint circulating system.

Many of the automobile parts, such as splash pans and radiator-carrying yoke, are black enameled. These are done at Los Angeles by an up-to-the-minute flow coat system. Using the principle of low pressure, high volume flow an excellent coat is applied to parts hung at random on a conveyor traveling at eight feet per minute. Two units are provided that turn out thousands of parts per hour.

The mixing of paint is done in a

remotely located paint house, thereby reducing the hazard. Paint is received at this plant in the conventional 52-gallon drums. After a thorough shaking it is ready to be placed on the line. The drum is moved in position in the paint house; the cover is removed and replaced with a special cover and pump assembly. Because the paint house is approximately 2200 ft from the farthest point of use, it was necessary to purchase air-operated pumps of special design to accomplish this difficult pumping task. Pumps deliver at the rate of 8 to 10 gpm through a circulating system approximately 4500 ft long. Multiplying this by the 52 colors installed for exterior colors indicates that over 10,000 gallons are required to fill the paint pipes. In addition to this, a system of 42 pots and circulating lines is installed on the second floor for the lower usage interior paints. When emptied, these pots are removed from the circulating lines and replaced with full ones of the same color. Empty pots are returned to the paint house for cleaning and refill.

The modern high-volume paint department layouts are difficult to clean and require expensive periodic cleaning. While Chrysler engineers have not been able to entirely eliminate periodic cleaning, they have taken a long step forward. The modern water-type spray booth requires great quantities of water in reserve to satisfy the demands of the high volume pumps. Because of the second floor location at Los Angeles, each spray booth is elevated three feet above the floor to make space for a pan to hold the water.

With the pumps in operation, the water level is adjusted in the pan to allow a percentage of the water to flow over a cloth filter. The water contains a flocculent that floats off accumulated overspray. Floated pigment is reclaimable for use as a prime coat.

Cleaning the floor grates of down-draft body booths is done quite simply by conveyerizing the grates, similar to an over-under conveyor. The return is the underside of the conveyor, and is pulled through the spray booth tank. This loosens the wet overspray that has collected on the grate. At the opposite end the grates emerge from the spray booth water, and again dip into a hot caustic. Emerging from the caustic, they are rinsed with clear water and again become the floor of the spray booth.

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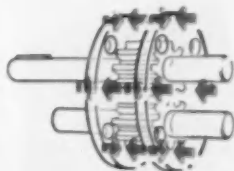


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Exhaust Valve Corrosion in Gasoline Engines

(Continued from page 55)

in corrosion rate with silicon concentration up to this value again shows that the optimum silicon for corrosion resistance should be very low.

Comparing the corrosion rates of the chrome-nickel and chrome-manganese steels, it appears that nickel and manganese are interchangeable. Other experiments have shown that

the effects of these two elements are additive, and that improvements in corrosion resistance can be attained by means of manganese additions up to about 10 per cent to the chrome-nickel alloys. Because of factors relating to the processing of valve alloys and their physical properties, these chrome-nickel-manganese austenitic

steels appear to be optimum. The effect of silicon in such steels is similar to that for the chrome-nickel and chrome-manganese alloys (Fig. 5) and low silicon contents are desirable for best corrosion properties.

Chrome-nickel-molybdenum (Fig. 6) and chrome-nickel-cobalt (Fig. 7) alloys have been investigated, although the latter has not achieved commercial importance. Molybdenum is a valuable strengthening agent, but in high concentrations has a tendency to oxidize. The objection to cobalt is purely one of economics, since cobalt has a pronounced effect in reducing the corrosion rate.

The nickel-base alloys are rapidly replacing the alloy steels in aircraft valve applications. In developing these alloys, variations in the nickel-iron content were investigated (Fig. 8). These results show that nickel is effective in reducing the corrosion rate up to very high concentrations. Some increase in corrosion appears to take place with nickel concentrations over 60 per cent, but this may have been caused by variations in the impurities. These data were obtained before the effects of silicon, aluminum, manganese and titanium were fully recognized. Later work showed that silicon and aluminum both had a deleterious effect. Magnesium up to about three per cent improved the corrosion resistance, and titanium also caused some improvement.

The TPM alloy currently used for aircraft valves comprises 16 per cent chromium, six per cent iron, three per cent titanium and two per cent manganese with the balance of 73 per cent nickel. Silicon and aluminum are both held to low limits. This alloy has given a very creditable account of itself, and one engine model reduced valve failures by a factor of seven.

A type of valve construction frequently employed for heavy duty engines incorporates a seat of welded material puddled on the valve face. In this way optimum corrosion and hardness properties for the valve seating surface can be obtained. Special alloys have been developed for this purpose (Table II). These alloys all have high chromium, cobalt and nickel contents to achieve corrosion resistance. The tungsten is used primarily as a hardening agent. The corrosion resistance of these materials is uniformly good (Fig. 9) and

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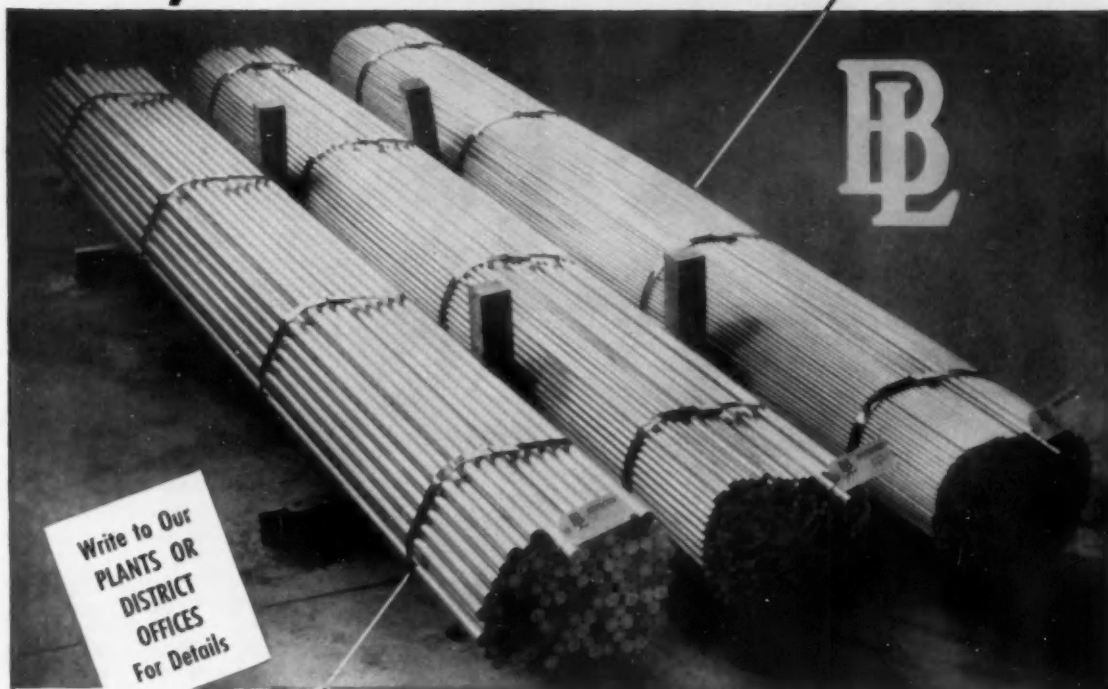
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superior to that of all commercial valve steels except TPM.

The alloy called X-782 is of particular interest. This alloy is used to coat the seats and heads of some aircraft valves made from TPM. This coating imparts additional pitting resistance to the valve, even though the laboratory test indicates that TPM is more corrosion resistant than X-782.

It should be pointed out that there are other ways to reduce exhaust valve corrosion than by controlling the material analysis alone. One of the most significant developments in this respect has been the widespread use of valve rotators. These devices cause the valve to turn, and function by knocking off the deposits that form on the valve stem and face. This improves the gas seal, lowers the valve temperature and thus retards valve corrosion. Engine tests have consistently shown valve life improvements of from two to five times, and today most heavy duty engines use valve rotation of one form or another.

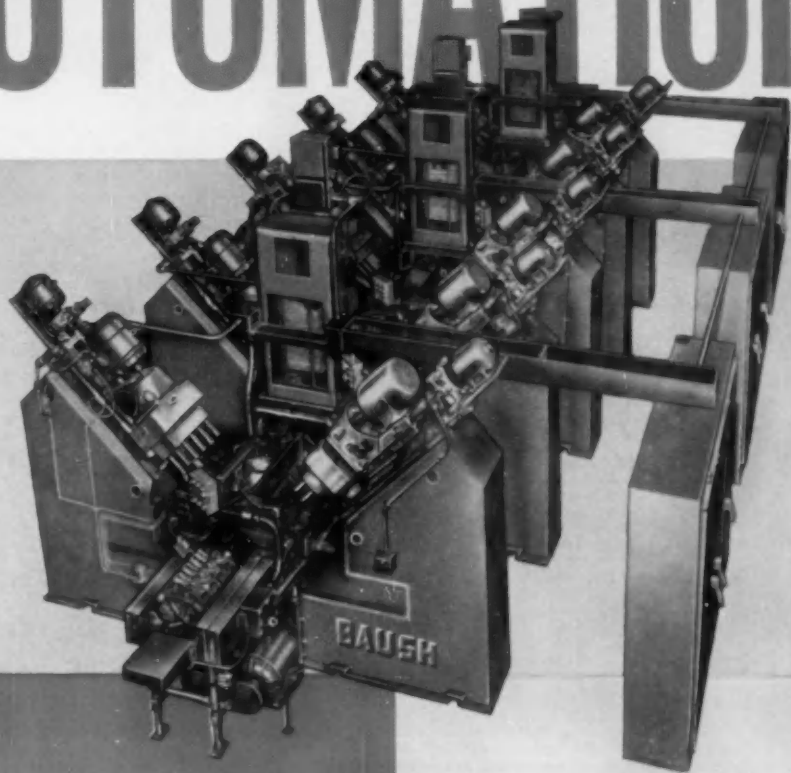
Another recent development is the use of protective coatings. In the General Motors Al-Dip process, a coating of pure aluminum is applied to the valve by means of a hot dip or metallizing process. The aluminum reacts with the iron in the valve steel to form a complex compound that is extremely corrosion resistant. Engine tests with this coating on XCR valve steel have shown improvement in valve life of from two to four times.

Much can still be accomplished in reducing exhaust valve corrosion. Although steels of conventional forging analyses have been fairly well explored, new processing techniques offer considerable promise. Vacuum melting is being investigated, and early results indicate that improved corrosion resistance can be obtained by this method. The casting of valves offers another alternative. By this method, highly alloyed materials impractical for forging can be handled. Composite valves of various materials and protective coatings are also being investigated further.

The authors wish to acknowledge the assistance of Mr. P. A. Jennings, Senior Research Engineer, Research Laboratories, Armco Steel Corp., in the preparation of this paper, and the use of his data.

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- 11 Idle Stations for ease of tool change or maintenance
- 1 Unload Station.

Blocks mechanically transfer from station to station and locate and clamp hydraulically at each work station. A total of 134 spindles, drill, chamfer, ream, mill, core-drill and counterbore 69 V-8 Cylinder Blocks every hour at 100% efficiency.



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SHORTIES

Thirty years ago, the oil industry employed 200 research technologists. Today, U. S. oil companies employ about 15,000 people in research activities.

There are an estimated nine million cars in use today that are 10 years old or older. This is twice as many cars more than nine years old as there were in 1939.

Sixty per cent of the purchasers of cars during 1953 bought them on credit.

The manufacturer of a modern bomber reports that 112,000 man-hours were required for final assembly of the first unit off production lines. Recently, after producing more than 700 of the planes, manhours for final assembly were down to 4150.

To print the 1040 income tax package for 1954 returns over seven million lb of paper were used. This represents the equivalent of enough blank stock to load 143 standard railroad freight cars.

There are about 25 million cu ft of Government records in existence, or enough to fill 7½ buildings the size of the Pentagon. The cost of creating and maintaining these records is approximately \$4 billion a year, and records are being created at the rate of about 4.2 million cu ft each year.

Every \$1 billion cut from the Federal budget means \$25 which the average American family of four can keep for its own purposes.

The 1.4 million gasoline pumps throughout the U. S. last year served more than 37 billion gal of gasoline—33 billion for passenger cars.



THOMAS J. WATSON, JR.

Portrait by Fabian Bachrach

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"I have always been proud of the fact that IBM was one of the first companies to put into effect the Payroll Savings Plan for the purchase of United States Savings Bonds, and I am delighted to see this patriotic endeavor continuing year by year and increasing throughout our organization. Today thousands of IBM employees, through their participation in the Plan, are helping their country and providing for the future of their families and themselves."

THOMAS J. WATSON, JR., President
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AUTOMOTIVE INDUSTRIES



Ford Transmission Plant

(Continued from page 69)

Gears are cut one by one, in separate setups, the 21-tooth second gear and reverse gear being handled in Fellows gear shapers, the other four in Cleveland hobbers. The involute spline, too, is cut in Cleveland hobbers. Chamfering is done in Sheffield machines. Shaving in the green is done on GCU-8-in. Red Ring rotary shaving machines on four gears; the

21-tooth gears being shaved in No. 870-8-in. Michigan Tool shavers.

The part then is washed and delivered to heat treat where the work is carburized in a continuous Holcroft gas carburizing furnace, provided with a salt bath for quenching without distortion. The work is washed, centers cleaned and lapped in an Ex-Cell-O lapper, straightened

to within 0.003 in. total indicator reading in a Hannifin 35-ton press. It is then given a draw at 375 F for one hour, shot-blasted in a Pangborn rotary Tablast machine and ready for grinding. Finishing-grinding is done in three individual settings in Norton grinders.

Each individual gear then is sound tested in the booths, using 18-in. Red Ring machines, lapped in Michigan Tool lappers, washed, and subjected to a complete final inspection.

The countershaft, another rather intricate part, includes an integral gear and five splined areas. It starts as a forging, milled to length and centered in a special Sundstrand mill. This is followed by turning five diameters in one setting, four diameters in another setting in 16 x 21 in. Fay automatic lathes. A diameter at each end then is green-ground in Cincinnati OD grinders to provide for accurate location for subsequent operations.

One of the most distinctive steps in the process is the gun drilling of a hole 1.160 in. in diameter through the length of the shaft in a four-spindle W. F. & John Barnes horizontal gun drill. This is followed by detail turning and finishing operations in Lo-Swing and Fay automatic lathes, green-grinding in Norton and Landis grinders.

Hobbing of splines as well as hobbing of the 14-tooth gear end is done in successive settings in Cleveland hobbing machines. Following some miscellaneous steps the 14-tooth gear is shaved in a Red Ring machine, the work is washed, and goes to heat treat where it is carburized and given a salt bath quench in the continuous Holcroft gas carburizing furnace. It is washed, centers cleaned and lapped, straightened, and drawn; then shot-blasted in a Pangborn Tablast machine.

Finish-grinding is done in successive steps in Norton grinders.

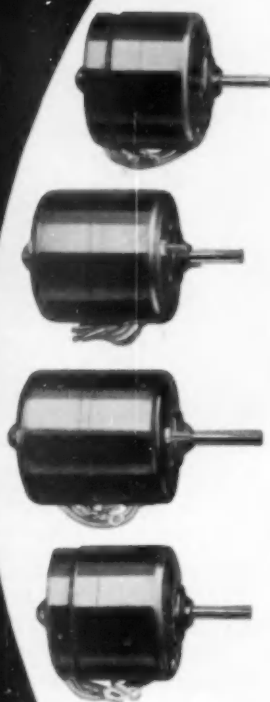
Developed cooperatively by Ford engineers and Michigan Production Engineering Co., the storage tier handling system, mentioned earlier, is designed to conserve space in the relatively crowded areas in the heat treating department, yet at the same time provides an efficient method of handling storage banks of gears and shafts contained in wire baskets. The problem in brief was to develop an efficient means of storing a variety of parts and releasing them in any pre-selected order as required in the heat treating operation.

To conserve space the units are narrow, run about 21 ft in length for

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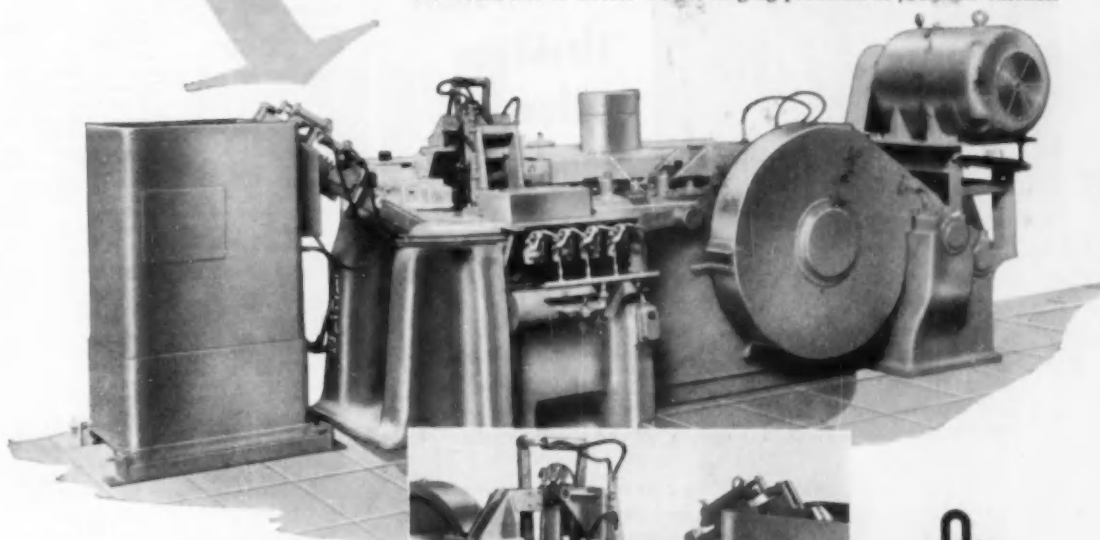
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a typical installation, and are about 15 ft high. As illustrated, a typical unit consists of a series of gravity roller sections, uniformly spaced in the vertical plane, with just sufficient clearance to permit baskets to roll freely between them. Elevators are installed at each end, the operator station at the front end having a pushbutton panel for selecting the tier to which specific loads are to be assigned. The length and height of each unit was determined by the types of baskets to be handled as well as the anticipated volume of baskets.

In operation, the operator stationed at the control end stands at a point to which all baskets are routed on a gravity roller conveyor. The operator selects the baskets to be stored and manually loads them into the elevator. Such baskets then roll down the receiving tier near the bottom to the elevator at the rear. The latter raises the baskets to the preselected tier and they roll down the conveyor on the tier to the front end to await removal.

For unloading the operator selects the specific tier from which baskets are to be removed, unloads them one

by one into the front elevator by means of pushbutton control. The elevator receives the basket and lowers it to the operator's position both for loading and unloading.

So far as we can determine this is the first application of automatically operated storage units of this character. Obviously, the basic design principle may be applied to other kinds of storage problems where space is at a premium.

BOOKS...

CONTROL OF EMISSIONS FROM METAL MELTING OPERATIONS, published by American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Iowa. Price, \$1.50 to AFS members; \$2.25 to others. Many factors are involved in the air pollution problem, such as community location, weather conditions, whether or not the community has industry, increased population, growing number of automobiles, etc., in different sections of the country. Various cities have established codes and laws in an effort to control air pollution. Due to varying factors which confront them, laws have been adopted which suit individual requirements. In many instances, however, equipment designed for a specific solution is not generally adaptable for the control of emissions from foundry stacks. The material in this booklet deals with the general subject of air pollution and its control and describes the engineering characteristics of the various types of equipment now in actual service for controlling emissions from metal-melting operations. Typical operating data, obtained from installations of several types of equipment are included. Information contained in the pamphlet will provide foundry management with a valuable guide to the steps necessary for control of air pollution.

DIRECTORY OF COMMERCIAL AND COLLEGE TESTING LABORATORIES, published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, \$1.00. This guide lists the locations of testing laboratories equipped and prepared to undertake testing on a commercial or fee basis. Information is given concerning 278 commercial testing laboratories and their 151 branches or offices. There is also presented a list of the laboratories of 86 colleges that are prepared to do testing under certain conditions. Research and consulting laboratories are not listed, unless they also are engaged in testing on a commercial basis.

SONICS, by Theodore F. Hueter and Richard H. Bolt, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$10.00. An exposition of analysis, testing, and processing of materials and products by the use of mechanical vibratory energy is undertaken in this book. With the unity of sonics as their keynote, the authors have drawn upon material from physics, engineering, and electronics as they relate to four major points. These are: the fundamental physics of vibration and sound; design principles of electroacoustic and fluid-dynamic transducers; choice of sonic variables for systems engineering; and special techniques for testing and processing. This information is cast within the framework of basic physics so that the common features of seemingly unrelated techniques and devices become apparent. In spanning the entire frequency range, the authors are primarily concerned with industrial applications.



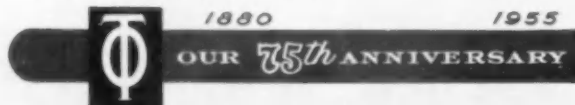
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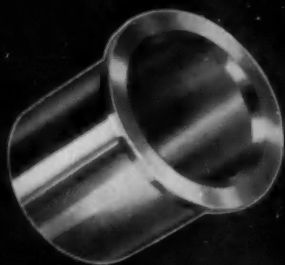
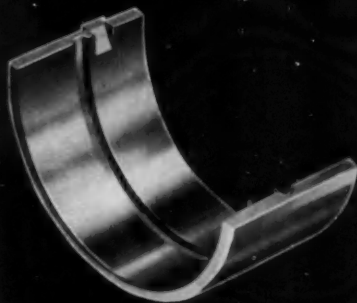
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Observations

By Joseph Geschelin

Without Chips

Chipless production methods now are engaging attention throughout the automotive industries. It's not a new idea but it has gained impetus because

of the wider use of scarce and critical materials in the military area; and the desire for better economy in civilian production. Among the techniques contributing to the elimination or at least reduction of metal removal are: powder metallurgy; cold forming;

cold extrusion; swaging; roll forming; precision casting; shell molding; and more recently — spin turning methods.

Advancing Art

Recent visit to Cincinnati Milling opened our eyes to the scope of fundamental research being carried on by this progressive organization. It is truly free enterprise at work, carving out scientific advances with its own resources. Here are marvelous scientific laboratories, equipped with the latest techniques: metal cutting investigations with the aid of radio-isotopes; analog computations; electron microscopy; infrared- and optical emission-spectroscopy; and the like. In this respect, it places the organization on the plane of the learned institutions.

Safety Fluids

A technical bulletin describing the procedure in the use of Houghton-Safe, safety hydraulic fluid, is now available. Non-flammable fluids are chemically different from the familiar hydraulic oils, have higher specific gravity, hence imply a heavier mass which must be forced through small orifices at high speeds. Among the precautions recommended by Houghton are: proper reservoir temperature; proper viscosity; types of filters best suited; and water make-up when needed.

Hue and Cry

We are beginning to wonder whether the rash of panel meetings on production problems is not being overworked. After all mass production techniques do not change radically over a period of months. It is a process of evolution. More can be gained, from the standpoint of news, from an occasional meeting than from three or four in succession. At least that's how it looks to this writer.

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What General Motors Expects of the Machine Tool Builder

(Continued from page 61)

In the mechanical press field, a great deal of work has been done with the Mechanical Press Builders' Subcommittee of the National Machine Tool Builders' Association. The Press Builders' Subcommittee, headed by Tom Bannon, chief engineer at Clearing Machine Corp., has cooperated with us, and a great deal of progress is being made. Presses are being standardized for bed area and shut height, standard method of rating, die mounting holes, pressure pin holes and knockout pin holes.

Non-Flammable Fluids

We in GM are concerned about fire hazards. When fittings fail, oil is atomized and sprays over large areas. If a welding machine is near or the vapor is ignited by any means, a terrific and terrible fire results. Right now we are having a spirited discussion about the use of non-flammable fluids in our hydraulic systems. Our general managers are insisting on the use of them, while our mechanical people say our equipment will not

stand up when they are used. The pumps wear out, the packing materials disintegrate and the gaskets fail. We realize there are many problems involved in the use of non-flammable fluids in hydraulic systems but we are going to be more insistent that you design and build your machinery to use such a fluid.

Control Panels

It is encouraging to note that control panels are being supplied us as separate units which can be elevated where no chips, coolant or dust can affect the electrical controls. This type of construction prevents the piling of stock in front of an enclosure, and damage from trucks handling material.

Another benefit is that access to them on these elevated platforms is restricted to maintenance personnel.

Lubrication

Lubrication of machines is a subject that can always be listed under "improvements." Production machines

should be so designed that lubrication can be accomplished with minimum interruption to production or no interruption at all. Systems of lubrication should be all inclusive and complete so that bearings will be lubricated from central points thus eliminating the probability that the lubrication of some vital bearing be missed.

Vibration

The latest problem being discussed is the subject of the elimination of vibration which affects surface finish, the rate of feed and the life of the cutting tools. Dynamic balancing should be considered in the design of new machines since today we are operating at higher speeds and feeds.

Gages and Indicators

New curves and creative thinking are desired. Examples that come to mind are the application of power indicators on heavy machine tools to indicate when cutting tools are dull or the machine is being overloaded. Another is the automatic gaging and the feedback of information for adjusting the machine to secure desired size.

One is the reduction of friction between adjustable elements to make possible a reduction in the increment of adjustment necessary to maintain close limits, and lastly those elements of design which will accomplish repeatability of performance.

In conclusion, we in General Motors believe that we have a great opportunity to improve our manufacturing methods and expand our facilities with new and better equipment. We think that the growth of our American population, estimated to be 20 per cent in the next 10 years, and the consequent growth of our economy warrant large expenditures for facilities to increase our capacity to meet this growing market.

This article was abstracted from a paper delivered before the 53rd Spring Meeting of the National Machine Tool Builders' Association in Chicago.

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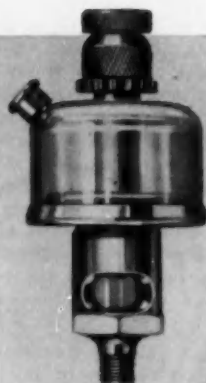
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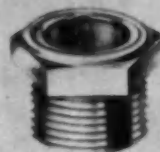
Rate of oil flow regulated by needle valve, directly observed through sight glass in stem.

Shut-off knob does not affect needle valve adjustment. Visible oil supply. Non-breakable. Tops in convenience and dependability, at low cost. Style NFU—No. 3602-A.



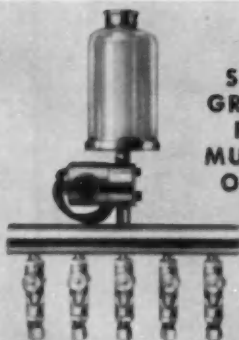
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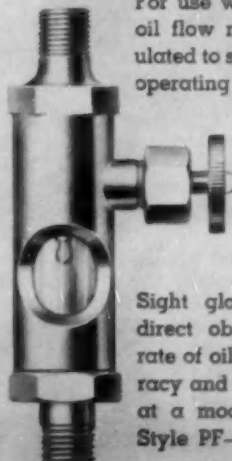
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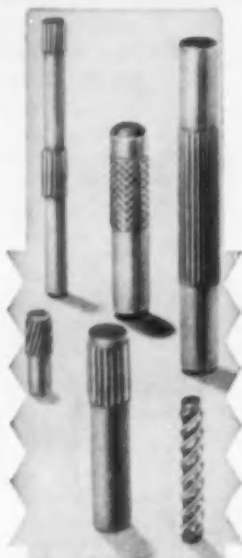
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Concerns seeking Government contracts are being urged to inspect anew the field of guided missiles and give some thought to production of some of the many components required in their use.

Predictions of the stability of fuels in extended storage may be effectively made by use of a new measurement method discussed in a Government report now sold by the Office of Technical Services, U. S. Commerce Dept., Washington 25, D. C. Title of the report, identified as PB 111553, is Light Scattering in Fuels, Part 1. Preliminary Studies on Diesel Fuel Stability. Price of the study is 50¢.

The Government is asking Congress for permission to buy another \$100 million worth of machine tools, and the chances that this sum will be approved appear bright. Principal tools to be ordered by the Air Force planners, for example, are large skin and spar mills, profile milling machines, vertical and horizontal boring mills, turret lathes, planners, hydraulic presses and some miscellaneous items.

Information about investment opportunities overseas is being gathered for American businessmen by a new Office of Foreign Investment in the U. S. Commerce Dept.

Defense Dept's interest in helicopters continues to grow. If Congress is willing, it plans to invest more money in helicopters in the 12 months starting July 1.

Building a ram-jet engine powerful enough to propel the guided missile of the future is one of the major tasks of the National Advisory Committee for Aeronautics.

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NIKE Supersonic missile selected to protect our cities



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A3D "SKYWARRIOR" Largest carrier-based bomber



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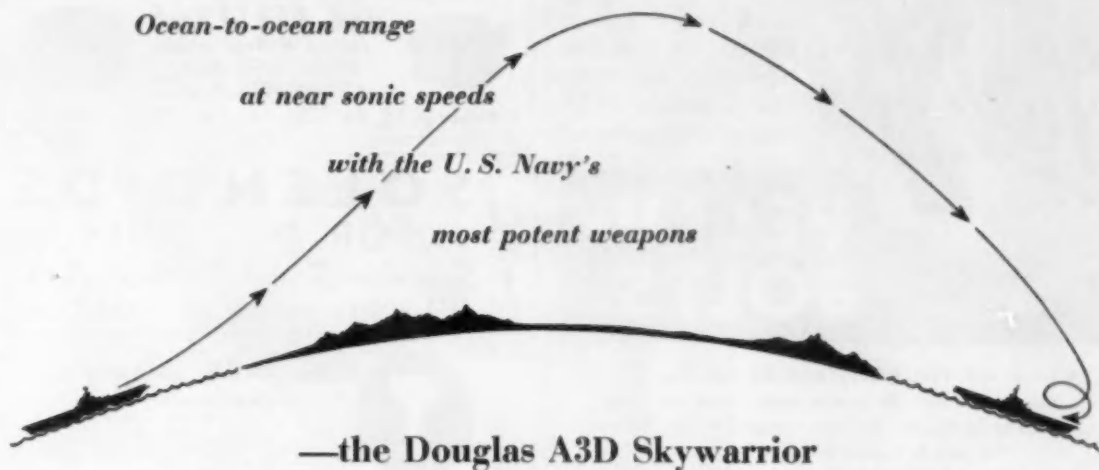
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would permit taking off from a carrier in one ocean, completing a mid-continent bombing mission, and continuing to a waiting carrier in an opposite ocean. Further, its simplicity of airframe allows wide flexibility in the missions it can handle. In short, the twin jet A3D Sky-

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Chem-o-sols are available for many application methods. New products are constantly being developed and established products improved by spraying, molding, die-wiping and knife- or roller-coating this versatile basic material.

Our completely equipped laboratory and trained chemists stand ready to assist you in formulating the exact **chem-o-sol** to improve your product.

Dipped sockets are a product of Watts Electric and Manufacturing Company, Birmingham, Mich.

Write for Bulletin 141

Chemical Products CORPORATION
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Tough grinding jobs?

Check **Vulcanaire**
high speed precision
grinding heads!



Grinding circular slot using Vulcan's Rotary Table and Magnetic Chuck.

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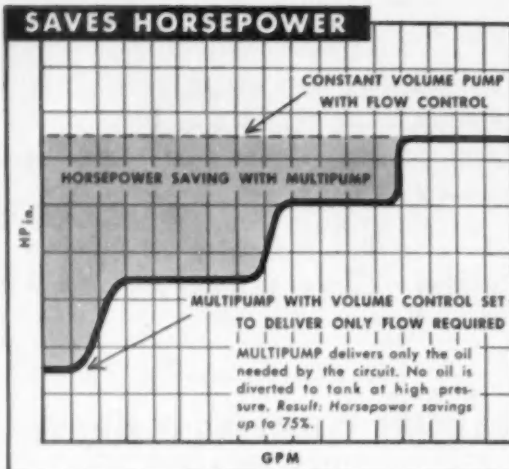
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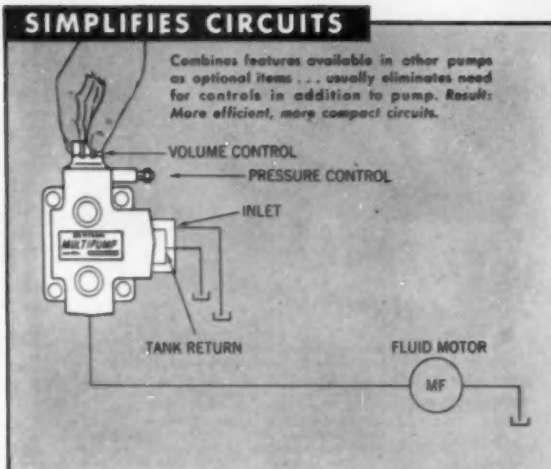
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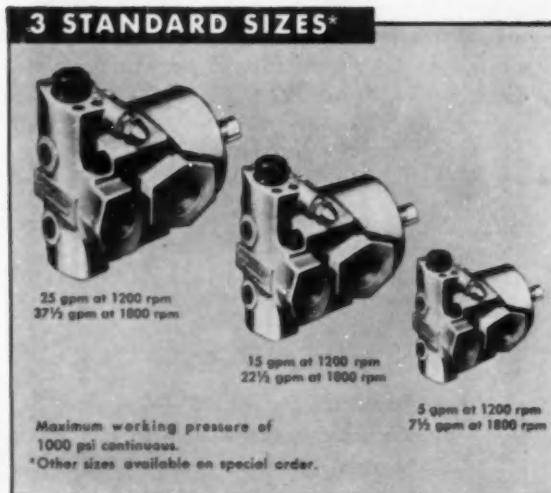
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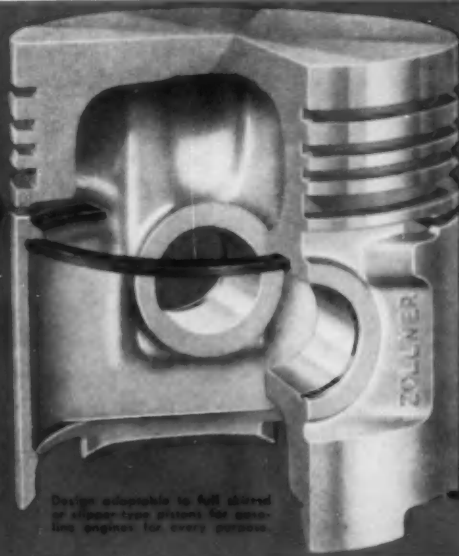
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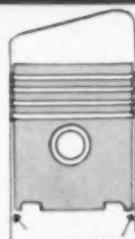
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